TROPICAL AGRICULTURE

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TROPICAL AGRICULTURE is published at the Imperial College of Tropical Agriculture, St. Augustine, Trinidad, West Indies, at the end of the third week of the month preceding the one of issue. Advertisement rates can be obtained at the College from the Editor, or from the Secretary of the College, 14, Trinity Square, London, E.C. 3, England. The Editor will be glad to consider authoritative articles for publication. It is understood that opinions expressed in signed articles are those of the author and do not necessarily represent the policy or opinion of the College Authorities. Increasing numbers of inquiries are being received from various parts of the tropics which can be answered only by persons possessed of an intimate knowledge of local conditions. Enquirers should first satisfy themselves that their local Department of Agriculture is not able to supply them with the desired information before communicating with us. Correspondence which will be replied to is invited on all other matters pertaining to tropical agriculture, science and development.

AGRICULTURAL RESEARCH.

Suggested Colonial Conference.

AN examination of the results achieved by the Imperial Agricultural Research Conference that has recently been held in England leads to a consideration of the factors that are likely to arise before the Conference resumes its sittings in Australia in 1932. One or two somewhat interesting developments appear to have arisen so far as tropical agriculture is concerned. Truly tropical agricultural matters appear to have received relatively little attention and it seems that agriculture as it effects the temperate and sub-tropical zones received the major attention and was most prominent in discussions. The reasons for this state of affairs appears to be fairly obvious. The delegates from the Mother country and from the self-governing Dominions appeared to have considerably outnumbered the Colonial delegates in each topic that came up for discussion. Again the Colonies were, in some cases, represented by junior officers only who naturally did not possess the necessary experience and confidence. The big Dominions were able to send some of their most prominent agriculturists and these were able to speak with great assurance and had the authority of their respective Governments behind them. It was natural also that the mere name of one of the big self-governing Dominions was enough to carry weight and was of more account than that of small Colonies such as Mauritius or the Leeward Islands. It is also understood that in many cases the detailed agenda of the Conference was not known until it was too late for certain of the delegates from the smaller Colonies to refer to the Heads of their respective Departments for instructions on matters of policy. Naturally under such conditions these delegates were diffident in taking part in discussions of this nature. So far as the delegates from the British Isles were concerned, they have had frequent opportunity of familiarising themselves with each other's work and of discussing informally the programme of the agenda. They were in constant communication with each other and have had the opportunity of frequently meeting, as compared with the delegates of the various Colonies, who in view of the great distances involved and the difficulties of communication have often had no opportunity of previously getting in touch with each other. One cannot help feeling that it would add greatly to the usefulness of the next big Conference, if some means could be contrived whereby the tropical Colonies could get together before hand and endeavour to form

a homogeneous party corresponding to the agricultural research workers of the British Isles or those of the Dominions. If some means of effecting this homogeneity could be contrived, it would undoubtedly result in tropical agricultural matters receiving a due amount of attention in relation to the special branch of agricultural research that happened to be under consideration.

The best means of effecting this result would be to call an interim conference of delegates selected from the Tropical Colonies before the main Conference is held in 1932. This preliminary Conference would discuss the agenda for the main meeting in 1932 and might also suggest additions or amendments to the agenda as necessity may indicate. This Colonial Conference might be held immediately before the 1932 Conference or about a year previously. In the first case it might have to be held in Australia. If held in the previous year the best place would be London, as that is the best centre for agricultural research workers who are on leave.

In addition to discussing the agenda, the Colonial Agricultural Conference would, if held in London, be able to suggest the names of delegates to attend the Imperial Conference having special regard to the subjects set down on the agenda and would be able to arrange that the various subjects should be adequately represented. This would certainly tend towards homogeneity and would ensure that the tropical Colonies would be better able to represent their cases in the future. It would probably result in a saving of expense, as owing to the methods of selection proposed only a few selected men would be sent to represent the tropics at the Imperial Conference. The Colonies might collectively bear the expenses of the chosen delegates, although this would not debar individual Colonies from sending additional representatives, if so desired. There has been much talk in recent years of the necessity for the interchange of research workers and of the desirability of their keeping in touch with each other. This is a matter that is admitted on all sides and it is perhaps even more vital to the research workers in the tropical Colonies. Many of them are small and they are scattered over a vast area and, in fact, encircle the globe. There is no other way than by getting some of them together at a central place and letting them discuss a definite agenda. The mere meeting of co-workers and the opportunity of discussing an allied problem at first hand is worth a great deal more than reams of written correspondence. The system was tried in India and nobody who has first hand knowledge of the facts as they applied to that vast sub-continent, can deny that the biennial meeting of the Indian Board of Agriculture did the greatest amount of good, not so much on account of the pious resolutions passed and of the recommendations forwarded in all seriousness to the Government of India, as by the actual personal acquaintances that the men working in the various agricultural departments made with each other.

"SELECTION" EXPERIMENTS.

A RECENT PAPER in the Memoirs of the Department of Agriculture in India, *Chemical Series* Vol. IX No. 1, by J. Charlton on "The Selection of Burma Beans (*Phaseolus lunatus*) for Low Prussic Acid Content" calls for some comment from a genetic point of view. The conclusions reached are: "(1) Environmental factors profoundly influence the HCN content of Burma beans. (2) Under ordinary field conditions the influence of environmental factors is more powerful in influencing the HCN content of Burma beans than is rigorous single plant selection. (3) Rigorous single plant selection during four years has not reduced the HCN content of Burma beans. Since especially favourable conditions over four or five successive seasons cannot be expected, the removal of HCN from Burma beans by single plant selection is an impossibility."

The last sentence completely ignores genetic principles. The prussic acid content of any given Burma bean is the result of interaction between the plant's inherent capability of producing that substance, and the particular field conditions under which it grew. The former factor is the only one influenced by selection, and it is, of course, entirely independent of the latter.

It may be true that it is impossible by selection to reduce the potential prussic acid content of the particular strain of *Phaseolus lunatus* used in this work, but the experiment reported proves the point no more than it proves the reverse. "Selection" was carried on from the season 1921-22 until 1924-25, but apparently no unselected control sample was retained from the 1921-22 crop and grown alongside the selected seed from year to year, so that there is no basis for comparison. The only possibility of comparison is afforded by a few cases in which alongside the progeny of a selected plant there was grown a bulk sample from such sister plants as failed to give a yield of thirty grams of seed! Two families which are specially emphasised as proving that a bad season rendered selection "entirely ineffective" show, as a matter of fact, slightly lower mean HCN contents than bulk samples of this unsatisfactory nature from the previous year, the differences being possibly, though doubtfully, significant statistically.

E. E. C.

THE Coffee crop of Costa Rica for 1926-27 was considerably smaller than that for 1925-26. The amount shipped to London increased, the United Kingdom and Colonies taking nearly 65 per cent. of the total exports of Coffee. Exhaustion of Soil and the spread of Panama Disease have resulted in decreased crops of bananas from the older plantations but the new areas coming into bearing have resulted in a slight net increase.

BANANAS AND CITRUS.

Report by Dr. Harland on his tour for the purpose of studying Bananas and Citrus.

Dr. S. C. Harland, Professor of Botany and Genetics at the Imperial College of Tropical Agriculture, 1923-26, was chosen to visit the East for investigations connected with Panama disease of bananas. At the same time limes were studied with a view to finding some means of controlling withertip disease. The tour, undertaken in 1925, was rendered possible by a grant from the Colonial Research Committee to cover expenses. The following is reprinted from the Report of the Committee for 1924 and 1925(Colonial No. 24).

It may be noted here that since the original publication of this report, several of its recommendations have been put into effect. The College recently received from Kew a first consignment of suckers from banana plants which were sent from the East and grown under careful quarantine at Kew until proved free from disease, and we understand that there are more to follow.

The decision to inaugurate storage tests and research on the ripening of bananas at the Imperial College of Tropical Agriculture has also been reached since the report was written.

The limes mentioned as received from Burma are growing well, though they have not yet fruited.

SECTION I.

PANAMA.

I LEFT Cristobal at 6 p.m., Sunday, 12th July by the S.S. *Parismina* and arrived at Bocas de Toro at 6 a.m. on 13th July. The headquarters of the United Fruit Company are at Almirante, a few miles further north at the mouth of the Chaguinola River—a river which is apparently geologically old, having formed for itself an alluvial plain by shifting its course many times during its history. It is in this valley—some twenty or more miles broad—that the operations of the Company are conducted. There are some 236 miles of light railway and at present the bananas are being brought from 56 miles up the river, Gros Michel having been practically abandoned in the lower regions. The main point that strikes one is the colossal fertility of the soil. Practically everywhere, it is said, there is a depth of rich soil of some 15-18 feet, and while drainage measures would seem to be indicated in some places, plant growth takes place with a rapidity and luxuriance that I have never seen equalled. The ravages of the Panama disease have caused the Company to find substitute crops for the abandoned areas. With labour costs comparatively high ($1.35 per day) this is no easy matter and so far the only alternative crop grown on any scale is cacao, of which there are some 25,000 acres of various ages from 3-12 years, and from which the production this year has been 3,300,000 lb., valued at about $3 per bag less than the Trinidad grade. The variety grown is apparently mainly *Calabacillo* with some gradation into *Forestero*.

Kapok has been tried, but the trees died out through some unknown cause.

Several thousands of acres of coconuts were planted but have failed, most of the trees being killed out either by red ring disease or by coconut bud-rot. Possibly the few trees left may furnish a residuum for selection work against these two diseases. Certainly, I have never seen such fine specimens as the young trees in bearing. Rubber is being considered and there are small plantings of mahogany and grape-fruit. Manila hemp is going to be tried.

The ravages of the Panama disease are illustrated by the huge drop in production of bunches from the former maximum of 5,000,000 bunches per annum to 2,500,000 bunches per annum for the Panama division. The discovery of an immune banana would be the greatest civilising force imaginable for Central America. The story of Costa Rica parallels that of Panama. The only bright spot is the Santa Marta district of Colombia, where bananas are being grown under irrigation and where (possibly through alkalinity of the soil) no disease is said to occur.

I accompanied Mr. E. S. Adams, Superintendent of Agriculture for the Panama division, some 25 miles up the valley, and there met Mr. J. Permor, a graduate of the University ot Pennsylvania, who is the Botanist in charge of the research work in the Panama division. Mr. Permor kindly invited me to spend the night at his house, which I did. The 14th July was spent in seeing the most interesting aspects of the banana and cacao work. The main points of interest so far as we are concerned are these :—

(1) There is being made at the present time no systematic attempt to obtain an immune Gros Michel banana by genetic methods. A seedling has been raised from the apple plantain, which is being suspected of being a hybrid between the manila hemp and the apple plantain. Though seeded, it is somewhat intermediate between these two parents. A few F2 plants are being raised.

(2) Seedlings are being raised from natural seed from the Philippines by Dr. O. Reinking, who is travelling in the East for the Company on the same errand, and covering practically the same ground as myself.

(3) A bud mutation of Gros Michel has been observed, and is being propagated. It is characterised by development of very dark anthocyanin (almost black) pigmentation of the leaf midribs. Probably it is of no practical importance.

(4) The most promising substitute for Gros Michel is thought to be the Lacatan banana from the Philippines. It is being shipped in small quantities but does not behave so well as Gros Michel in transit. It takes some five or six days longer to ripen and ripens more unevenly. Mr. Adams believes that some investigations on shipping conditions are

required and states that the Boston market takes Lacatan most readily. At all events the Company are planting 300 acres of Lacatan to test the whole matter out on a large scale. If Lacatan fails, I believe that they will fall back on Cavendish or some other type.

(5) The Giant Figs from Grenada are growing well and appear to resemble the Bluefields banana from Hawaii, suckers of which were sent some time ago by Dr. Reinking. It is conceivable that the Giant Fig will be preferred to the Lacatan, and it seems very desirable for the Company to try it out, as they are in a much better position than we are to experiment on shipping quality.

(6) The collection of banana types at Almirante comprises about twenty varieties, practically all of which we have in our own collection, and none of sufficient importance to send to Trinidad.

(7) A number of varieties are being sent from the Philippines by Dr. Reinking and will be quarantined at Bocas on an island reserved for the purpose.

(8) I returned to Cristobal on the 15th July and sailed for Los Angeles on the S.S. *President Van Buren*—17th July.

SECTION II.

CALIFORNIA.

1. I arrived in California, at the port of San Pedro near Los Angeles, on 25th July, and proceeded immediately to Riverside, which is about sixty miles inland, and situated in the middle of a typical citrus-growing area. Riverside is the site of the California Citrus Experiment Station, where 300 acres are devoted to citrus experiments and where a highly competent staff are engaged in research in problems connected with the citrus industry.

2. I spent eight days at Riverside and roughly covered the following ground in discussions with various workers :—

(*a*) Status of parasite work in South California with Professors Smith and Quayle of the Entomology Department.

(*b*) The physiology of Citrus. Professor Reed and Mr. Halma.

(*c*) The Pomegranate industry. Professor Hodgson.

(*d*) The Date industry. Mr. Paul Popenoe.

(*e*) The pruning of Citrus. Professor Hodgson.

(*f*) The economics of the Citrus industry. Professor Hodgson.

(*g*) Citrus by-products. Chief Chemist of the California Fruit Growers' Exchange.

(*h*) The cytology and genetics of Citrus. Dr. H. B. Frost.

(*i*) Citrus species. Dr. Swingle of the U.S.D.A.

3. I was especially interested in the work of Dr. Howard Frost on citrus hybrids. He has at the present time more than 4,000 hybrids involving all possible combinations of orange, lemon grapefruit, and mandarin. He was good enough to show me the collection. The results of some of his work will be published at an early date and bear quite considerably on our proposed hybridization work with limes. The difficulty of obtaining citrus hybrids depends on the frequency with which the female parent produces apogamic seedlings. There is a high negative correlation between number of embyro in the seeds and percentage of hybrids obtained. Thus the lemon is mostly mono-embryonic and may readily be hybridised if used as female parent. Another point of interest is that apogamic seedlings may be tetraploid, characterised by thick leathery leaves and by other pronounced morphological differences. Tetraploid varieties of sweet orange, lemon, Dancy-tangerine and grapefruit have all been noted. I explained the lime problem to Dr. Frost and he was of opinion that the breeding of a lime similar to the present one, but with resistance to wither-tip, would be very difficult. All citrus species are evidently in an extremely heterozygous condition, though it is clear that the lime breeds extraordinarily true from seed. This, however, may be due to apogamy. My own idea is that the crosses rough lemon × lime should first be thoroughly studied and then Kusai lime × lime, in the light of Dr. Frost's observations.

4. The work of Frost has been of considerable service in clearing up the bud mutation selection in citrus. He is of the opinion, and in my view rightly so, that the Washington Navel orange is in a complex chimaeral condition, and that the frequent unfavourable branch mutations observed are due to the coming to light of different and inferior chimaeras. Shamel entitles all his papers the improvement of the Washington Navel orange. Probably all that has been done is to preserve the *status quo* by suppression of chimaeral varieties.

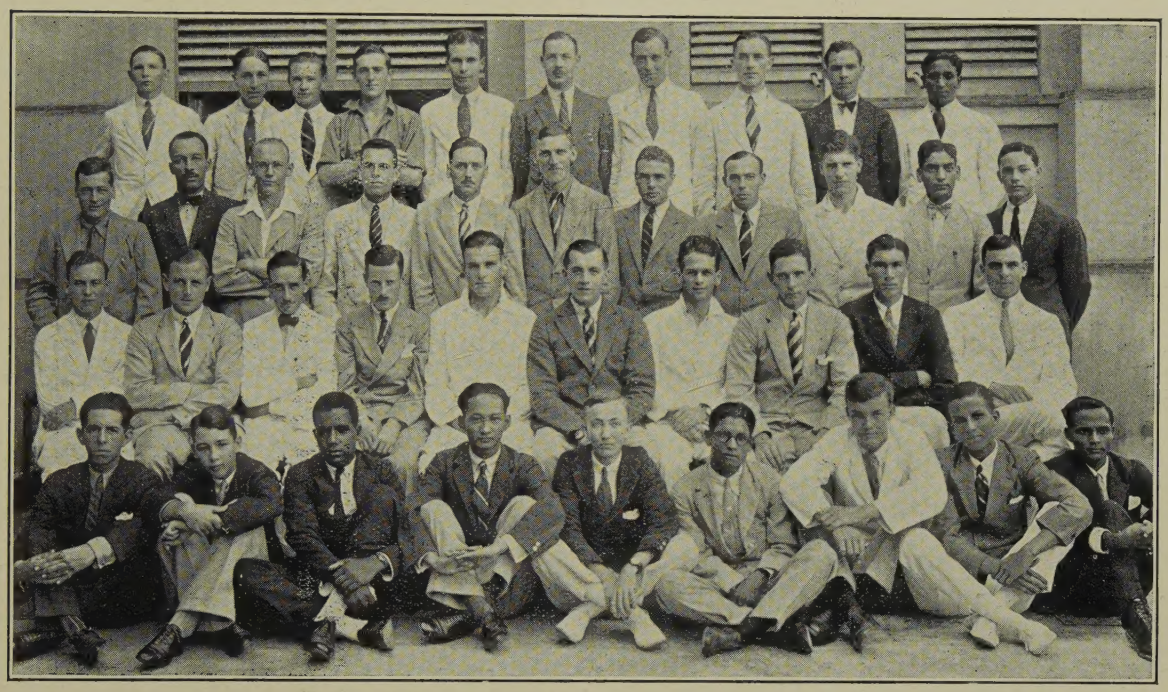
5. Among the hybrids made by Frost a few have undoubted commercial value, particularly some hybrids of the orange and Dancy-tangerine. In view of the extreme specialisation of the California industry—two types of orange only being grown—it is doubtful whether any commercial use will be made of them in that state.

(*To be continued.*)

CONTRIBUTIONS.

THE EDITOR is prepared to consider signed articles for publication in *Tropical Agriculture*. Such articles should normally vary between 1,000 to 6,000 words and may be illustrated if desired. Rates can be obtained on application to the Editor.

STUDENTS IMPERIAL COLLEGE OF TROPICAL AGRICULTURE, SESSION 1927-28.



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Absent :—MR. S. J. F. DIAS, MR. T. H. NICOL.

TROPICAL AGRICULTURE.

BY HAROLD COX.

Mr. Harold Cox, the well-known writer on subjects of economic interest, has contributed this article dealing with the College to the British Empire Supplement of "The Outlook."

FROM the industrial and commercial point of view, the principal asset of the West Indies is the richness of the soil and its capacity to yield a large variety of tropical products; the scientific development of tropical agriculture is therefore a matter of supreme importance. Among recent steps taken to further this development is the establishment of an Imperial College of Tropical Agriculture in Trinidad. That island seems to have been chosen for the site of the college mainly because it is fortunate in the possession of many lines of steamship communication with other parts of the tropical world. The college owes its origin to the report of a committee appointed by the late Lord Milner when he was Secretary of State for the Colonies in 1919. It was started in provisional buildings at the end of 1922. Since then substantial new buildings have been erected, largely at the expense of the planters of Trinidad; but contributions to the cost of upkeep are made by several of the smaller West Indian Islands, and a considerable contribution has been and is being made by the Imperial Government. In addition, a sum of nearly £30,000 has been raised in England by private subscriptions to a fund inaugurated by Lord Milner.* The governing body, of which Sir Arthur Shipley is Chairman, has its headquarters in England at 14, Trinity Square, E.C. In Trinidad, also is published a monthly magazine called *Tropical Agriculture*, which is specially devoted to the affairs of the College.

The wide scope of the work that the College sets out to cover may be gathered from the official syllabus of studies. Starting from the study of the elementary principles of soil management, the courses go on to deal with agricultural botany and plant physiology, with chemistry and soil science. The College curriculum also includes courses on the manufacture of crop products, dealing with the processes by which various substances are extracted from tropical raw materials and converted into commodities which the world wants to buy. Necessarily, this leads on to the economics of production and sale, to the financial problem of estates and factories, and to the problems of marketing. Attention is also devoted in the College to the very important questions of tropical sanitation and hygiene. It is a widely extended programme, but not wider than is needed. The importance of applying science to industry is perhaps even greater in dealing with tropical products than with the industries of Europe; for European industries have behind them the accumulated experience of many generations, whereas tropical industries are relatively new. In addition, tropical industries are more liable to sudden changes, due to the vagaries of nature. A hurricane may sweep across a plantation at a critical moment and the crops may be ruined, or a plant disease may break out and begin to devastate large areas of land. If, then, man is to master nature in the tropics to anything like the extent that he has mastered nature in temperate climates, it is essential that he should make a systematic and scientific study of the problems of tropical agriculture. To provide facilities for that study is the essential purpose of the Imperial College in Trinidad.

As the name of the College implies, its activities are not limited to the West Indies. It is intended to serve the whole Empire, and, in fact, students from all parts of the world are welcomed. Students are not admitted until they have reached the age of seventeen. The last report of the College records that among students in residence, in addition to those from the United Kingdom and the West Indies, numbering about fifty, there were four from South Africa, one from Brazil, one from Egypt, and one from Ecuador. Considering that the College is barely four years old, that is not a bad beginning. But the service that the College renders to the rest of the world, and in particular to the Empire, is not measured by the number of students who come to Trinidad from other tropical countries. What happens is that students from England or Scotland or the West Indies get their training in Trinidad and then obtain employment in tropical parts of the Empire, where they make practical use of what they have learned at the Imperial College. According to a recent statement by Sir Arthur Shipley, the College has already sent trained students to the Sudan, the Gold Coast, South Africa, Nyasaland, Uganda and Ceylon.

I had the pleasure a few weeks ago of visiting the College and seeing how its work is carried on. Classrooms and chemical laboratories are, of course, much the same all the world over, but at Trinidad much of the work, perhaps indeed the most important part of it, is carried on in the open air on patches of ground devoted to experimentation. This practical work not only teaches the students how to deal themselves with the details of plant growth, but it also provides an accumulation of facts, with the aid of which it is hoped that many of the difficult problems of tropical agriculture will in time be solved. Among the difficult problems to which the College authorities are now devoting special attention is the problem of Panama disease. This is a disease which attacks the banana plant and has already caused enormous losses in Central America, in Cuba, and in South Africa. It has also appeared in most of the West Indian islands, in the Philippines, in Sierra Leone, and as far away as Dutch Surinam. There appears to be no way of permanently preventing the advance of this disease except by producing a type of banana plant that will be immune. To a certain extent this has been done, but the trouble is that the banana plant that is immune to Panama disease

* The late.

bears a fruit that is not attractive to the purchaser. The problem to be solved is to grow a banana that is both immune to this disease and also marketable. Needless to say, this means an enormous amount of experimentation, and many years may elapse before the problem is fully solved. Another pest which is causing much trouble, especially in Trinidad, is the froghopper, which attacks the sugar cane, and a special Froghopper Committee has been formed to study the best methods of combating this insect. There is also a serious disease called withertip, which attacks the citrus fruit.

The students at the Imperial College are taught to help in the research work required for the scientific study of these and many other plant diseases, and they obtain practical experience which will fit them for work in other parts of the tropical world. The students also have an excellent opportunity for studying the machinery side of tropical industries, for British manufacturers of sugar machinery have very generously presented the College with a completely equipped up-to-date sugar factory. It is to be hoped that the work of the College will rapidly extend. The need for it, especially within the British Empire, is very great. Large portions of the Empire are tropical, and these tropical countries supply many of the foodstuffs and raw materials that are required by the inhabitants of temperate regions. It is only necessary to enumerate such products as tea, sugar, cocoa, coffee, tobacco, cotton, sisal, jute, rubber, and numerous fruits and various oil-producing nuts. So far as these industries can be developed by the application of improved methods, of production, based on scientific study, the whole world will gain.

TOBACCO INDUSTRY OF ECUADOR.

IT may be recalled that up to 1923 the tobacco, salt and spirit monopolies were in the hands of the Government of Ecuador whose yearly net profits, due to lack of efficient administration, were much less than 1,000,000 sucres.* The country had annual tobacco crops averaging 14,000,000 lb. which were big enough to supply the heavy local demand and to export appreciable quantities of manufactured tobacco to various Republics on the Pacific Coast of South America.

In 1923 the National Congress of Ecuador passed a law authorising the formation of the Compania Ecuatoriana de Estancos (Ecuadorian Company of Monopolies) which was to take over the Government monopolies and to pay annually the sum of 2,000,000 sucres to the Government. The Company had a paid up capital of 2,000,000 sucres locally subscribed. Minimum prices were fixed by the Government in order to protect the interests of the producers who, in the case of tobacco, were almost exclusively peasants.

* Sucre = { at par 2s. / at present 1s.

The Compania Ecuatoriana de Estancos, as it was expected, made very good profits during 1924, so that it was able to pay 2,000,000, sucres to the Government and to give over 100 per cent. dividend to the shareholders, but the Board of Directors had to face a very serious situation. They had a very efficient staff in the offices in the different towns and villages as well as very good travelling inspectors, but on account of the enormous size of the country over which the tobacco industry is spread the lower employees abused their semi-official position to such an extent that a strike of producers was called for in 1925. The Compania Ecuatoriana de Estancos did all that it could to dissuade the producers, but they solidly refused to plant any tobacco. Under these circumstances the Compania Ecuatoriana de Estancos tried to establish tobacco areas of its own, but this was too much of an undertaking, and, therefore, in 1925 most of the tobacco for local consumption had to be imported, while the exports of manufactured tobacco practically ceased. This caused a rise in prices and great discontent in the country.

In order to remedy the defects of the private administration of the monopolies, the Government cancelled the monopolies to the Compania Ecuatoriana de Estancos. Then it took up the industry and adopted most of the methods and organization of the Compania Ecuatoriana de Estancos including the members of the staff who had proved to be valuable, at the same time giving the tobacco growers all the required guarantees and encouragement.

From a recent statement by the Department of Agriculture of Ecuador, the 1926 tobacco crop was estimated at over 3,000,000 lb. which it is said will be sufficient for the local consumption, but the export trade will still remain paralysed. It seems that most of the growers abstained from planting fearing abuses similar to those existing during the time that the monopolies were in the hands of the Compania Ecuatoriana de Estancos.

Great improvements were expected during 1927 as the Government's attitude regarding the growers during 1926, the distribution of seeds of important foreign varieties (especially of the cigarette type) and the practical courses and advice given throughout the country by experts engaged by the Government have persuaded the growers to take greater interest in tobacco.

M. A.

THE London School of Hygiene and Tropical Medicine has added a new department for an advanced course in bacteriology and "immunology," and students will be prepared for the new diploma in bacteriology of the London University. The course of study will include the bacteriology of public health and of industry.—(*The West India Committee Circular*, Vol. XLII, p. 403.)

CURING OF VANILLA.

Mr. F. H. S. Warneford, B.SC., M.A., *Assistant Chemist, Government Laboratory, Antigua, paid a visit to Dominica during the latter part of* 1926. *The report of this visit was submitted to the Imperial Institute for comment, and the following notes on the curing of Vanilla were submitted by the Imperial Institute.*

THE drying and curing of the pods of vanilla are of much practical importance, since they have a great effect on the value of the final product.

If left to ripen on the plant, the pod, which is at first green, gradually turns yellow (beginning at the lower end) and splits open. It continues to darken, changing through brown to black, and takes about a month to ripen fully. The characteristic vanilla odour, which is not present in the freshly-ripened pod, develops as the pods darken. If left to themselves the pods dry up and become brittle and odourless.

The object of the artificial methods of curing that are employed is to accelerate the ripening and to render it uniform throughout the length of the pod, and also, by arresting the natural vegetative processes, to prevent the splitting of the pod which entails loss of perfume.

METHODS USED IN MEXICO.

(1) *Sun Curing.*

Sun curing is the ordinary method of curing adopted in Mexico. The pods are picked when they are just beginning to turn yellow at the end; if allowed to remain on the plant beyond this stage there is a risk that they may split. The pods are then spread out in single layers on shelves ("camillas") in a clean place, which is well ventilated and protected from rain, and are left for 24 hours during which they lose moisture and shrivel. During this stage they are kept under observation and sorted according to their degree of ripeness; those pods that show a tendency to blacken being smeared thinly with castor oil.

The next day the pods are spread out on tables in the sun, preferably alongside a whitened wall facing south. The tables are covered with sacking, on which are placed woollen blankets, of a dark colour (to conserve the heat) and on these the pods are spread out, singly, with their thick ends towards the sun.

Before sunset, the pods, which are now almost too hot to handle, are placed in boxes. These boxes have themselves stood all day in the sun, and are lined with blanket material that has also been similarly exposed. The pods are piled in the boxes with their thick ends in the centre of the box, and the blanket lining is folded over the top of the pile. In this condition, with every precaution to conserve the heat, the pods undergo the process known as "sweating." After 16-22 hours they have usually acquired a dark brown colour and are removed from the boxes, any pods that have remained green being set aside and treated in ovens. (*See* oven curing)

The pods are then allowed to dry for a period which may last from 20-30 days, according to the weather. During this period they are placed on the camillas, advantage being taken of fine days to expose them to the sun for one or two hours at the hottest part of the day. They are also subjected again during this period to the sweating process some 4 or 5 times; this number should not be exceeded or the pods may become soft and discoloured.

(2) *Oven Curing.*

The curing of vanilla by sun heat is only possible in fine weather. If the weather is unfavourable, recourse is had to the oven method of treatment, which, indeed, is stated to be used increasingly in place of the sun process. The oven process requires close attention and skill in order to avoid loss of material through faulty curing.

The pods are tied up in bundles, of flat rather than cylindrical shape, each consisting of from 100-400 pods. Each bundle is wrapped in a woollen covering, then enclosed in sacking, and tied up with cord. The bundles are then placed in an oven.

The oven has been previously heated, and the fire removed, the temperature at which the treatment commences being 89° C. to 125° C. according to the number of bundles to be treated (the larger the number the higher the temperature). An average number of bundles to be treated at a time is from 16-20, for which the commencing temperature would be 111° C. to 115° C. The oven should be made to cool as slowly as possible it is recommended that, if it is not in frequent use, the oven should be kept at a high temperature for some time before use, and in any case, it should first be heated to a higher temperature than that at which it is to be used, and then allowed to cool to the required temperature, a thermometer being placed in the middle of the oven to indicate when this temperature is attained.

The oven being at the correct temperature the bundles are rapidly introduced, by means of a rod having a hook at its end, and the oven is then closed.

After 16-22 hours the pods have generally acquired the proper colour, though it is a common practice after about 12 or 14 hours to remove and examine one bundle in order to gauge the further length of treatment necessary. Should the temperature have become too low, the oven is re-heated, the bundles being temporarily removed. Or less satisfactorily, the bundles may remain in the oven, being protected by damp sacking.

When the bundles are finally removed from the oven they are wrapped in blankets in order that they may cool very slowly. The next day they are exposed in the sun or on the camillas, according to the weather. For a subsequent 20-30 days the pods are dried in the same way as described under "sun curing," and are "sweated" 4 or 5 times.

During the drying process the pods are carefully inspected, and any that are misshapen or unripe, or that have split open, or show mould or abnormal

crystallisation, are separated and placed in different classes according to their particular defects.

Finally the pods are graded according to colour, firmness and length. They are made up into packets of 50, and packed in tin boxes, each box containing 60 packets all of the same grade.

METHODS USED IN OTHER COUNTRIES.

In the French Islands of Madagascar and Reunion a process that is commonly employed is treatment with hot water. This is known as the "boiling water" process as when it was originally introduced the water was employed at a temperature near its boiling point. At present a temperature of 60° C. to 65° C. is regarded as more satisfactory.

The pods are placed in baskets according to grades, and the baskets are dipped into a cauldron of hot water for 2-3 minutes according to the grade, the larger pods having the longer treatment.

An alternative to this treatment is exposure to steam, the pods being placed on a perforated shelf over water near its boiling point, the whole being contained in a closed vessel.

In either case the pods are afterwards immediately transferred (after being allowed to drain for a few moments, and while still hot) to sweating boxes similar to those already described. They are then exposed in the sun for 6-8 days until they reach the proper condition, and are finally allowed to dry slowly in the shade in a well ventilated drying house.

Less elaborate methods are used in other countries. Thus in Peru the pods are immersed in boiling water and hung up to dry in the open air. After drying for some 20 days they are smeared with castor oil and tied up in bundles.

IT was decided at a meeting of the Empire Sugar Section of the British Empire Producers' Organization, which represents the entire sugar-producing industry of the British Empire, to constitute the section into a federation, the membership of which will include the producers and refiners of the sugar industry and all others interested in the production, transport, and marketing of Empire sugar. The objects of the federation are to promote the interests of the sugar industry of the Empire, and to collect information in regard to all matters relating to methods of production, transport, and marketing; to carry out a programme of propaganda and publicity with a view to increasing the production, sale, and consumption of Empire sugar, and to obtain such treatment for Empire-produced sugar as will secure stability, and generally to take such action as may be considered desirable in the interests of the Empire sugar industry.—*The Times Trade and Engineering Supplement*, No. 485, Vol. XX, p. 100.)

INTERNATIONAL TRADE IN COFFEE.

An exhaustive statistical account of coffee is given in a pamphlet—"Trade Promotion Series" No. 37—issued by the United States Department of Commerce.

COFFEE, introduced commercially into Europe in the seventeenth century from Arabia nearly in company with cocoa from South America and tea from China, has become of more importance as regards quantity and value in the international movement of trade than either of its companion beverages. In 1924 the world trade in coffee amounted to approximately 2,968,000,000 lb. with an estimated value of $519,400,000, as compared with 1,121,000,000 pounds of cocoa, valued at $87,438,000, and with 766,539,000 lb. of tea, valued at $224,596,000. In the year 1925, as a result of higher prices prevailing for all three commodities, the combined value totalled more than $1,000,000,000, not including the value of quantities retained in the producing countries for domestic consumption, but taking into account only the amounts entering into world trade.

These beverages may properly be considered along with the economic products of the world, since the success or failure of the crop in any country that numbers coffee, cocoa, or tea among its principal crops has a vital influence not only on the economic conditions within the country but may result in disturbed market conditions for several years in distant purchasing countries. This is especially true of these products, inasmuch as they (unlike such annuals as cereals and cotton) require from time of planting at least three years—generally four or five—to produce in commercial quantities sufficient to offset a shortage due to pests, rains, droughts, and frosts in any particular growing region.

An additional consideration is the fact that any limitation or enhancement of purchasing power in these so-called monoculture countries resulting from poor or good yields has a decided effect upon sales of goods manufactured in the consuming countries.

In the history of the coffee trade there has always been one country in dominant position as a supplier of coffee. The first country to occupy this dominant position was Arabia, then it was held by the West Indies, later by the Dutch East Indies. At the present time Brazil, which exported in 1924 14,266,000 bags valued at $320,386,000, is the source from which approximately two-thirds of the coffee is obtained. The other third coming chiefly from about 18 countries located in tropical and sub-tropical belts. The five Republics comprising Central America, Guatemala, Salvador, Costa Rica, Nicaragua and Honduras form the second group and furnish 8.6 per cent. of the world's coffee, exporting well over 1,700,000 bags. Asiatic countries make up the third group, with 7.5 per cent. and in the neighbourhood of 1,500,000 bags

each year. The principal exporting countries are:—The Dutch East Indies, British India, Arabia, Straits Settlements, French Indo-China, and the Federated Malay States, in which, however, the production of coffee is gradually declining. Fourth in the order of size among coffee-producing areas are the West Indies, including Haiti, Porto Rico, Jamaica, the Dominican Republic and Guadeloupe, which contribute jointly some 800,000 bags annually or 3.9 per cent. to the world trade. Coffee grows in other West Indian Islands, but the crops of these minor districts is of little importance commercially. There is a tendency, however, towards increased production in Trinidad.

Viewed in its general aspect the world's demand for coffee has been increasing yearly since 1909 until the set back in 1925 which will doubtless prove of temporary duration. Brazil did not contribute to the increase in exports to the extent that might be supposed. On the contrary, the volume of coffee moving out from the Brazilian ports was only 1.2 per cent. larger than in the five years prior to the war. Whereas before the war Brazil was the source of 70 per cent. of the world's coffee, it now fills about 63 per cent. of the demand from consumption centres. Colombia, Dutch East Indies, Africa and Central America have come forward in the trade, raising the total exports and at the same time lowering the percentage from Brazil. The most notable advance occurred in the case of Colombia whose exports during 1909-13 accounted for 4.3 per cent. and during 1919-23, 9.1 per cent. of the world exportation. The Dutch East Indies advanced from seventh place to third in the period 1919 to 1923. African coffee made an appreciable trade.

Since the cultivation of coffee is confined to areas located with the tropical and sub-tropical zones, countries outside of these regions necessarily fall into the category of importers, a fact that places the bulk of consumption in the Northern Hemisphere. The chief importing country is the United States, the net imports into which during the five years 1919 to 1923 averaged 9,682,000 bags, or 48.8 per cent. of the world deliveries. In pre-war days only 38.5 per cent. was taken. The other large group is comprised of the countries of Europe, which in 1919 to 1923 consumed annually an average of approximately 8,727,000 bags, or 44 per cent. of the world deliveries. The remaining 7.2 per cent. is distributed principally among Cuba, Canada, Argentina, Chile, Uruguay, French Guiana, Paraguay, Egypt, Algeria, Tunis, South Africa, Australia, and New Zealand.

The United States takes almost half of the world deliveries of coffee (it is interesting to note that in 1801 United States import of coffee from Brazil amounted to only 532 lb.). In Europe, France now stands as the largest importer and ranks second to the United States in the total quantity imported and retained for consumption. In the years preceding the war this position was held by Germany, but the order now is Germany second, followed by Italy, Sweden, Belgium, and the Netherlands. Judging by net imports, consumption is apparently increasing in France, Italy, Belgium, Sweden, the United Kingdom, Denmark, Spain, Norway, Switzerland, and Greece. All of these countries have taken coffee in greater amounts in the years from 1919 to 1924 than in the pre-war years.

There then follows in the pamphlet an account of the coffee industry of certain countries summarized in order to give a general idea of the situation, chiefly in exporting countries. Whenever data are available the acreage, production, number of trees, local consumption, harvesting and export seasons, weight of export bag, principal ports of exportation and countries of destination are shown.

Let us consider the position of those lands within the British Empire. In British Guiana the cultivation of coffee was gradually abandoned after the abolition of slavery, and now production is on a small scale. Out of an output of 900,000 lb. about 700,000 lb. are exported to England and British possessions. In Jamaica the acreage under cultivation has remained fairly steady for over 10 years, varying from 18,000 to 22,000 acres. The quantity exported averaged about 7,000,000 lb. in the years 1919-23. Canada is the principal market for Jamaican coffee, taking about two-thirds of the output.

In British India the acreage under cultivation in 1923-24, was distributed as follows: Madras 33,487, Coorg 31,642, Mysore 69,607, Travancore 886, Cochin 2,424—a total of 138,046 acres. The total reported crop of cured coffee in 1923-24 was 19,145,403 lb., and this went chiefly to the United Kingdom, France, Asiatic Turkey, Bahrein Islands, Arabia and Australia in the order named.

The colonies of Kenya, Uganda, Nyasaland, and Tanganyika in British East Africa produce a considerable amount of coffee. Exports from this section increased from 34,000 bags (of 132 lb.) in 1913-14 to 226,000 bags in 1922-23. In Kenya Colony 27,813 acres were reported planted to coffee in 1920, and in 1925, 65,000 acres were under cultivation. The trees are spaced 435 to the acre, which would mean that there are some 28,275,000 trees in the Colony. The average yield per tree is a little over 1 lb. Coffee is shipped from the port of Mombasa, principally to London.

The statistical tables which complete the report give up-to-date information on most of the points one would look for.

G. W.

WE have to acknowledge with thanks the receipt from H. M. Stationery Office of Special Reports Nos. 15, 20, 21, 22, 23, 24, 27, 28, 29 and 30 of the Food Investigation Board (Department of Scientific and Industrial Research). These reports deal with various aspects of the storage and transport of fruit, especially apples, and are of interest for their bearing upon similar questions connected with bananas and other tropical fruits.

SLEEPING SICKNESS.

Control in Africa.

THE extension of the fly belts in East Africa which led to the appointment of the Royal Commission on sleeping sickness under Dr. Lyndhurst Duke, still goes on unabated and is assuming really serious proportions at the present time. Large native areas have been depopulated and in other areas all domestic cattle have been killed off, consequently there has been no milk for the children and infantile mortality has been enormous.

The question whether Trypanosoma rhodesiense is one and the same parasite as that producing magana in cattle remains unsolved. Owing to the dreadful lessons man has received in the past by upsetting the balance of nature they are loath to commence the destruction of the wild game which apparently act as a reservoir of supply of the Trypanosomes for the tsetse fly. So far the only measures that have been effective in controlling the spread of the outbreaks have been the removal of natives and cattle from the infected areas and wholesale grass and scrub cutting and burning, and cutting the vegetation away from the banks of the rivers and fords. Some of the difficulties and decisions made will be found enumerated in the following reports:

Nigeria. Sessional Paper No. 1 of 1926. Report of the Tsetse Fly Conference held at Kaduna, September, 1925. 45 pp. 1926. Lagos: Government Printers.

The greater part of this report consists of matter with which those who are interested in tsetse fly control have for some time been well acquainted—matter circulated mainly for the benefit of non-professional members before the assembling of the Conference. The essence of the Report appears in a paper by Dr. W. B. Johnson and Mr. Ll. Lloyd which is to be found in an Appendix. These authors state that sleeping-sickness is increasing in the northern provinces of Nigeria and that its increase is attributable not to increased spread of the tsetse fly, but to: (1) a tendency of the inhabitants to start small scattered farms; (2) to the freer movement of the people in modern times; and (3) to the play of large enterprises like railway construction and mining, where labour is being brought in touch with colonies of fly. They believe that they can eradicate the fly from the northern provinces by the method of clearing and settlement which creates an environment unsuitable for it. They have proposed to make an experiment to this end in an area of about 30 square miles draining into Lake Chad, where the water-courses are bordered by dense fly-infested thickets. This area they propose to be cleared, settled, and cultivated. Two local Emirs have been interested in the project which now only requires authoritative sanction. If the experiment proves as successful as Swynnerton's similar but larger experiment in East Africa it would be natural to expect that the method of control by clearing and big settlement would be generally adopted. The authors recognise that this would be a matter of special administration on the basis of co-operation between the sanitary, veterinary, agricultural, forestry and mining departments, and this Conference, held at Kaduna, on the 25th of September, 1925, is the outcome of their proposals.

In the organization of settlement schemes of tsetse fly control various interests outside the sanitary department are affected, and information must be collected from various sources. The *Administrative Service* would have to consider how native chiefs could be interested in the subject; how natives could be induced to settle in the clearer lands—by remission of taxation and forestry fees, by exemption from forced labour outside their settlement, by bonus, by digging them wells and making them roads, by free or cheap issue of farming implements; how pressure might be brought to bear on the native administration; whether late grass burning could be enforced, whether the existence of small scattered farms could be forbidden; whether immigration of alien natives could be permitted; and whether political officers could be spared and seconded for co-operation and supervision. The views of the *Veterinary Department* will be wanted upon the effects of late burning upon pasture; upon movements of cattle; and upon the stationing of veterinary officers or the starting of ranches in the cleared areas. The co-operation of the *Agriculture Department* comes in with advice on farming the cleared tracts; with the question of encouragement of settlers by distribution of seeds and implements; and with the question of departmental farms. In respect of the *Forest Department* it is necessary to know whether clearing is likely to lead to desiccation, and whether late burning of grass would affect the forest reserves; the department also can give advice in methods of clearing. The *Mining* industry is touched in the matter of regulations for medical supervision of labour; for compulsory clearance sufficient to keep large gangs of men separate from fly; even for actual prohibition in districts where trypanosomiasis is prevalent; similar questions affect the *Railway Department*. Last come the questions of the necessary staff and the cost.

It is the scope and nature of the questions that is of a general interest; but the opinion of the Veterinary and the Forest Departments that late burning of grass, if continued, ruins pastures and leads to desiccation, may be noted. The Forest representative also expressed his conviction that the segregation of fly-infested areas is futile so long as the ubiquitous and large-scale annual migrations of Fulani cattle are permitted or are uncontrolled; movement should be confined to special "lanes" 8 to 10 miles wide, and these lanes would be lanes of clearance and settlement.

The Conference agreed to the proposed experiment in clearance and settlement, and to the extension of survey work, and it admitted the necessity of supervisionary measures in connexion with mining and railway construction. It " found itself in agreement " with the suggestion of a subsidy of £10,000 for 1926-27, of £15,000 for 1927-28, and of £20,000 for 1928-29 for tsetse fly investigation. It approved the proposal that five medical officers and one administrative officer should be seconded for tsetse fly and trypanosomiasis investigation, and that one officer from each of the agriculture, forestry, and veterinary departments should be available for assistance ; and it recommended that an organizing committee should be formed with the Senior Tsetse Investigator as Chairman.

A. A.

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Rodhain (J.). Le recul de la tsétsé : *Glossina morsitans* devant l'occupation europeenne au Katanga. [The Retreat of *G. morsitans* before the European Occupation of Katanga.] *Bull. Soc. Path. Exot.* 1926. Vol. XIX, No. 3, pp. 222-235. With 1 text fig. [3 refs.]

This paper is full of detail. Its conclusions, of general interest, are that in Katanga—in the regions of Elizabethville, Bukama, and Kabalo *Glossina morsitans* has disappeared from considerable tracts of woody savannah (park forest) since 1911-1912. In the higher and drier Elizabethville country this species has withdrawn beyond the cleared and settled land ; but in the lower and more humid Kabalo country only to the limits of the cleared land. In the former country there has been a corresponding disappearance of big game animals ; in the latter country only a thinning of their numbers.

In the case of *G. palpalis* there has been little change, this species having disappeared only in certain places in Bukama where the banks of the river have been cleared.

A. A.

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Rhodesia Agricultural Journal, Vol. XXII. No. 6, pp. 634-635. Operations against Tsetse Fly.

As tsetse fly have been invading a settled area in the Lomagundi district an attempt is to be made to bar their advance. The barrier is to be a strip of land 10 miles wide (and 30 to 35 miles long) enclosed within two fences. The southern line of fence is to be erected first, and then as the northern line is being set up, in sections, the game will be driven out—not destroyed. The outside of the two fences will be further protected by brushwood ; but nothing will be done to the strip of land enclosed within the fences except burning its brushwood in the course of driving out game, and clearing a margin of 50 yards just inside each line of fence. When all is finished the fences will be patrolled by a European with native assistants to keep the fences in repair and shoot any animals trying to break through the barrier.

A. A.

Jack (R. W.). Tsetse Fly in the Lomagundi District Experimental Operations.—*Rhodesia Agric. Jl.* Vol. XXIII. Nos. 2 and 3. pp. 134-150 ; 257-267. With 1 map and 7 figs.

This paper describes the inception of an experiment for preventing the spread of tsetse fly from a focus lying about Long. 30° E. and Lat. 17° S. between the Angwa and Hunyani tributaries of the Zambesi. The local forest is described as mainly Brachystegia savannah, with some fringes of big forest in places along banks of streams. Big game of various species is fairly plentiful. Fly has been spreading from this area, probably because the settlers are really farmers and do not shoot, the natives do not carry arms, and a dog tax is levied.

To clear a belt of forest and maintain it clear, in order to stop the outset of fly, would be too expensive for a country so scantily populated and infertile. For the same reason killing off the fly by late grass fires is impracticable. In short the Swynnerton policy of enlisting the inhabitants is not feasible, since there is not a sufficiency of inhabitants to enlist to any purpose. The policy decided on, therefore, is to create a gameless buffer of forest between the fly-infested areas and the farmers settled beyond it. Two fences have been set up along a front of about 30 miles between the Angwa and Hunyani rivers, one fence being along the edge of the settled country and the other fence being 10 miles outside it. The fences are six feet high, and are made of six to seven strands of 12½ gauge barbed wire stretched where possible on living trees as posts. The forest along either border of this fenced zone has been cleared to a depth of 50 yards, and beyond each border-clearing is an additional rampart of brushwood. Within the cleared zone the game has been expelled, and no cattle or sheep or goats are to be allowed to enter it. A European forest ranger with a staff of native hunters keep the fences, &c., in repair, and stop any return of game.

—(*Tropical Diseases Bulletin* Vol. XXIII, No. 9.)

THE Council for Scientific and Industrial Research of the Australian Commonwealth Government, which is financed by a vote of £250,000, is investigating, among other probelms, the eradication of pests affecting agricultural development. As an instance of the magnitude and gravity of the problems the case of prickly pear may be cited. This pest now covers 60,000,000 acres in New South Wales and Queensland, which is about three times the total cultivated area of Australia, and is reported to be spreading at the rate of one million acres a year. Measures which would merely prevent its spread would result in the saving of £250,000 annually at the low valuation of 5s. per acre. Insects for destroying the prickly pear have been introduced and the results are encouraging.

TROPICAL WORLD NOTES.

Southern Rhodesia.

THE Agricultural Industry in Southern Rhodesia continues to show a very healthy tone, and the past twelve months have proved a period of rapid and for the most part highly successful expansion. The Government Agricultural Statistician when presenting his report in February last, for the year 1925-26 stated that the Colony during the year could be considered to have made steady progress. Since that date crops of the 1926-27 season have been harvested and the latest returns indicate a record production of tobacco, maize and citrus fruit, combined in the case of the two former with what is still more important, namely record yields per acre.

Tobacco is the crop claiming most attention at the moment and production has increased remarkably and appears likely to continue to increase. In 1925-26 some 14,000 acres of tobacco yielded about 5,650,000 lb. weight of leaf, 300,000 lb. of which was Turkish tobacco. During the 1926-27 season, it is estimated that about 30,000 acres were planted, the total yield from which is expected to be not far short of 17,000,000 lb. of leaf tobacco. Pessimistic rumours have been current as to the immediate market for Rhodesian tobacco in Great Britain, but inspite of this many planters are still increasing their acreages and many who have not previously grown tobacco will do so during the coming season. Until the taste of the consuming public in Great Britain becomes appreciative of the flavour and aroma of Rhodesian tobacco, there is some danger that the rate of market absorption may temporarily lag behind the increased rate of production. Growers, however, are receiving ample warning of this and the surest safeguards they can take against much a contretemps is concentration on quality rather than quantity, combined with the most careful handling and marketing of the leaf, and a steady though not too meteoric expansion in acreage devoted to the crop.

Maize is the staple grain product of the Colony, and at the time of writing some 100,000 bags of this year's crop have been exported. The total output is expected to exceed 1½ million bags, and it is a matter of interest that many farmers in the Maize belt have this year (1927) obtained record yields per acre in spite of an unusually low rainfall. Interest in higher yields has been much stimulated by the Maize Growing Competitions organised by the Maize Growers and Breeders Association of Southern Rhodesia. The heaviest yield obtained in this competition and that awarded the first prize ran to the satisfactory total of 31½ bags of shelled grain an acre, while the average yield of the nine highest yielding plots was only a fraction under 30 bags (200 lb.) an acre. Each competitor manures, fertilises, and, apart from irrigating it which is not permitted, otherwise treats his crop as he thinks best, and at the end of the season supplies full particulars of the treatment to the Maize Association by whom the results are compiled and published. It is believed that these competitions will continue to prove a potent factor in indicating how maize yields over the whole Colony can most effectively and economically be increased.

Amongst other annual crops of lesser importance may be mentioned cotton, ground nuts and sunflower. The former for a number of reasons is temporarily somewhat out of favour, but at the Government Cotton Seed Farm good progress is reported in the breeding of Jassid resistant strains of cotton of high quality. Mr. Peat an ex-student of the Imperial College of Tropical Agriculture is in local charge of this work. It is hoped that through the agency of the improved seed issued from this farm cotton will again within the next two or three years figure as a crop of some prominence in the Colony. Ground nuts are being grown more largely than ever, the increase in acreage last year being over twenty per cent. More is understood about this crop and its requirements, and amongst leading growers who treat it as a major money earning line returns of 1,000 lb. or even more of unshelled nuts an acre are becoming the rule rather than the exception.

Citrus fruit growing for export is mainly confined to the Estates of the British South Africa Co., but there are also a number of smaller producers, and export for the season 1927 is expected to reach the record figure for the Colony of 150,000 cases. In addition to the Market in Great Britain, new openings for marketing in France, India, Greece and Egypt have been explored with very promising results.

Coffee is receiving renewed attention and more careful management on the farms of the eastern border and in the same zone experimental plantings with tea are giving favourable results.

The market for beef cattle, though better than in recent years, is still somewhat depressed and herds are not increasing as rapidly as they did just after the War. More thought is now given to improvement in quality, and there having been created an outlet for large numbers of low grade cattle, a general improvement in the class of breeding stock retained is apparent.

The Dairy Industry and its concomitant pig raising, is expanding. Improvement in the breeding and general management of dairy stock is reported and there is a keen demand for good dairy bulls.

A steady inflow of settlers is being experienced, and the Government is exercised more by the need to discourage the type of man not likely to succeed in the Colony, rather than by the necessity to take any special steps to attract settlement.

H.G.M.

Malaya.

The prosperity of Malayan trade and industry is dependent upon an adequate supply of labour. Fortunately we are situated, geographically, sufficiently close to the main sources of supply, namely, China and India.

The mining industry is more or less exclusively conducted with Chinese labour. On the rubber estates the Indian labourer from Southern India predominates, but there are also a large number of Chinese employed on the various rubber plantations throughout the country.

In the towns Chinese are almost universally employed in rubber, saw and rice-milling and building trades; while Indians are employed as ordinary labourers in construction and maintenance of roads and public works. The Chinese again predominate as house servants.

From time to time there have been undoubtedly considerable shortages of labour in the planting industry, but the excess of arrivals over departures, in Malayan ports from non-Malayan ports in 1924 was 100,000 and in 1926 it was no less than 300,000.

As in other countries British Malaya has during the last twenty-five years had periods of commercial depression and prosperity, but for a young country it must be admitted that the prosperity predominates, and in any case it would appear that she is worthy of every effort which the administration, producers and merchants can make to obtain the fullest and most reliable statistics of the industries and trade which have produced such outstanding results in what is really only a few years in a country's development. —(*Chamber of Commerce Journal*, Vol. LIV, p. 304.)

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St. Vincent.

The British island of St. Vincent, in the West Indies, is the only supplier on a commercial scale of arrowroot, which is obtained from the root of a plant resembling the aspidistra. There is wide scope for extending the use of this valuable foodstuff, for it is unsurpassed as the chief ingredient in such table delicacies as custard and blanc mange. In gravies, soups, and pastries it is so infinitely preferable to cheap foreign starch made from potatoes that the small additional cost is not worth considering, especially as arrowroot is very economical to use.

Vigorous efforts are being made to popularize arrowroot as a wholesome foodstuff and to dissociate it from the idea held by a section of the public that it is only suitable for medicinal purposes. Exports during the last three years have varied between 2,950,000 lb. and 3,292,000 lb.; the United States is buying it to an increasing extent. Prices have kept very steady and vary from 4d. to 11d. per lb. according to quality.

St. Vincent's most important export next to arrowroot has been Sea Island cotton (473,219 lb. in 1925 and 638,000 lb. in 1926), but planters have been discouraged by the recent fall in price. Copra and molasses are also shipped.—(*The Times.*)

West Indies.

The West Indian Chamber of Commerce submitted the following two resolutions at the Congress of Federation of the Colonies of the British Empire, which was held in Capetown last October.

(1) That this Congress, mindful of the pressure of severe competition fostered by the fiscal policies of foreign countries to assist their own production, views the sugar situation in the British West Indies and British Guiana with grave concern. It emphasizes that measures must be taken by H.M. Government to assure the future of the Empire sugar industry, and urges as a step in that direction the admission into the United Kingdom of raw sugars of Empire origin free of duty, together with an assurance that should the rate on foreign sugar be reduced within the next few years a compensating advantage, either by means of a subsidy or otherwise, would be given to the Empire product; alternatively, that the present money value of the preference should be increased to that granted to the British West Indies and British Guiana by Canada, *i.e.*: 4*s.* 2*d.* per 100 lb. on 96 test, and for a similar period of years.

(2) That this Congress places on record its whole-hearted approval of the steps being taken to establish an Empire Sugar Federation which shall co-ordinate and foster both cane and beet production and other interests associated with the Empire sugar industry. Further, it respectfully suggests that the establishment of a Sugar Research Station within the Empire should receive consideration.

In view of this the Durban Chamber withdrew its resolutions and decided to support the West Indian Chamber of Commerce.

* * *

Tanganyika.

The table below gives the Department of Agriculture's estimate of the cotton and ground-nuts crops produces in the Territory this year (1927) for export. The reduced cotton crop as compared with last year (24,280 bales) is due to decreased plantings following the low market prices last year.

Province.	*Cotton Bales.*	*Ground-nuts tons.*
Mwanza	8,500	5,000
Tabora	900	4,000
Kigoma	—	100
Eastern	6,000	—
Lindi	900	200
Northern	200	—
Tanga	100	—
Bukoba	50	—
Central	—	4,000
	16,650	13,300

RICE IN BURMA.

Production, Trade and Improvement.

(*Continued.*)

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Deputy Director of Agriculture, Southern Circle, Burma.

II. Trade.

THERE was no cognizable rice trade in Burma prior to the annexation of Pegu by the British in 1852, and the rice trade as now understood has grown up and developed since the opening of the Suez Canal in 1870. Rice milling became centred in the large towns of Rangoon, Bassein, Moulmein, and Akyab, through which ports all rice for shipping had to pass, and these towns have grown with the trade on which their expansion has chiefly depended. There is now a tendency towards decentralisation in the milling industry, and small mills capable of dealing with as little as ten tons of paddy per day are springing up along the main lines of communication throughout the country, and in all considerable paddy centres. These small mills now prepare most of the rice for country consumption but some of their output is also bought by exporters. Their number is still growing and exerting a noticeable effect on the internal rice trade, but the large towns aforementioned are still the chief milling centres and are likely to remain so for some time to come.

In dealing with the production of rice, we left the paddy cleaned and winnowed on the cultivators' threshing floor. A portion of it goes in kind to the landlord as rent, the fraction varying from one-fourth to one-half of the total produce. Another portion goes to repaying loans and hired labour; and the remainder is sold for milling to brokers who travel from village to village, and threshing floor to threshing floor, buying for their principals. The paddy so bought is carted to the nearest railway town, to a loading point on the river bank, or to a small mill as the case may be. When the paddy is bought by a trader it is usually carted to his own storage go down and held there against subsequent rise in price. Where the paddy is being loaded into a boat or put into storage, it is carted loose, an average load for a bullock cart being 1,200 lb.; where it is intended to be loaded on rail it may or may not be bagged, bagging being common on the main railway lines. In all these cases the cartage and bags are paid for by the buyer, the village price known in any locality from day to day being the threshing floor price.

The unit of measure is the village basket which is a woven bamboo affair holding over eight and a half bushels of grain weighing from 47 to 51 lb. This measure is very variable, differing from village to village and even within the same village. Different baskets are used for different purposes or the same basket may be altered to suit the purposes of measurement in hand. Thus a basket made smaller by having its wooden rim removed is used for paying wages and if possible, debts, while, for measuring rent, the landlord insists on bringing his own basket, and in one village one of these is known by the significant name of the cart breaker. The real connecting link between baskets is the Milkmaid Brand milk tin, the size of a basket being definitely known by the number of milk tinfuls of paddy it contains. The usual size is about 124 milk tins. To the east of the Pegu Yomas or hills the measure is the litchi tin of about twice the capacity of the milk tin. This variability in the size of the basket is exploited a good deal by brokers buying paddy, and the profits made in this way are far in excess of the proceeds from ordinary brokerage.

The paddy brought into a Rangoon mill by rail or by boat is measured in a different way by the miller. It is still bought by the basket, but the millers' basket is a standard 9-gallon measure. For this he fixes a basic weight of 46 lb. of paddy and for paddy weighing more than 46 lb. per 9-gallon measure he pays a premium of 2½ per cent. per extra lb. The system is really one of weight cum measurement buying and in practise it has somewhat the effect of a grading system, heavy paddy being paid for not only at a higher price than light paddy, but also at a higher rate. The following example will make this clear.

Number of baskets in consignment.	Weight per basket.	Weight of whole consignment.	Price under poundage system.	Price if paid on weight only.
	lb.	lb.	Rs.	Rs. Ans. P.
100	46	4,600	200	200 0 0
100	48	4,800	210	208 11 0
100	50	5,000	220	217 6 3
100	54	5,400	240	234 12 6

The benefit of this poundage rate, however, rarely reaches the cultivator. The subsequent rise in the price of paddy which nearly always takes place later in the season when supplies become scarce is also of no benefit to him since he has had to dispose of the whole of his crop at the cheapest time of the year. A good deal of paddy is stored in the districts by traders and speculators who have storage accommodation, and this is sold later. The great bulk of the crop, however, is thrown on the market in the first four months of the year and this is the period of most active milling and export. About 50 per cent. of the exported rice is shipped during the months from January to April, and as this coincides with the period when the Indo-China and Siamese crop is also thrown on the market, the world's prices for rice are then at their lowest level. From January to March while the paddy is being transported to the towns and the mills, cart tracks, roads, railways, and creeks, present an animated appearance. Long lines of creaking carts wend their way along temporary cart tracks cut through the paddy fields; the creeks are

alive with craft of all sorts, from sampans carrying fifty baskets to paddy gigs carrying seventy tons ; and at each railway station great heaps of loose grain are piled up in the open waiting for transport or a rise in the market. It is these heaps of paddy at the railway stations which impress the casual visitor most.

In up country mills the Rangoon system of weight cum measurement buying is not always followed, and in some districts the paddy is bought entirely by weight, the quality of the sample being assessed mutually by the buyer and seller at the time of sale, and the price fixed accordingly. Small mills which can mill separately a few hundred baskets at a time are in a position to pay better prices for specially good lots of paddy than the big mills which want ten thousand baskets at a time, whereby a good deal of fair and indifferent paddy has to be mixed together to make up a milling lot. For home consumption in the smaller villages some rice is still husked and partly polished by the indigenous mortar and lever-like pestle device, but for general consumption, milled rice is in commoner use.

The small mills produce a limited number of grades of milled rice and by the commonest form of milling obtain from 40 to 43 baskets of white rice from 100 baskets of paddy, which means that about 3,225 lb. of rice are obtained from 5,000 lb. of paddy. This amounts to over 64 per cent. by weight, and as the husk may be put down at 20 per cent. of the whole, the odd 6 per cent. represents broken rice and bran. There is a recognised system of grades, however, among the bigger mills, each grade depending on the amount of broken rice which is removed or left in. The more important of these are as follows :—

Variety.	Quality.	Per cent. broken.	Baskets of rice per 100 baskets of paddy (approx.)	Remarks.
Ngasein	No. 0 ..	5	25 to 26	Same degree of milling.
	No. 1 ..	10	28	
	No. 2 ..	26	30 to 32	Less severely milled.
	No. 3 ..	27	32 to 34	
	S.Q. ..	36	35 to 37	
	Small Mill specials	38 to 42	40 to 41	Unpolished.
	Big Mill specials	44	41 to 42	Unpolished.
	Loonzein	Contains 2 per cent. paddy	41½	
Midon	No. 0 ..	5	27 to 28	All unpolished.
	No. 1 ..	10	30	
	No. 2 ..	24	32 to 34	
	S.Q. ..	32	37 to 39	
	Bazaar ..	36 to 38	42 to 43	
	Loonzein	Contains 2 per cent. paddy	47	
Emata	Sughandi Super ..	5	27	
	Sughandi Special ..	10 to 15	30	
	Sughandi Ordinary	30	35	
	Small mills	40 to 45	38	

At one time a great deal of rice was exported as cargo rice which consisted of partly husked rice with a proportion of unhusked paddy amounting to 40 per cent. This went mostly to European countries for re-milling. The export of this sort of rice has disappeared almost entirely and complete milling and polishing are now done in Burma. Polished rice shipped to Europe, however, deteriorates in appearance during the long sea voyage and is repolished, glazed, or oiled before being passed on to the consumer. A good deal of loonzein is shipped for re-milling but this is much more completely milled than the old cargo rice and contains only 2 per cent. of paddy.

The practice of parboiling paddy before milling is assuming important dimensions and is worthy of special mention. In this process, paddy is steeped in water tanks for twenty to thirty hours at a temperature of 100°F. ; then transferred to cylindrical containers where it is lightly steamed, but not sufficiently to cook it ; and finally removed to drying floors where it is raked over in a thin layer and thoroughly dried in the sun. This parboiled paddy is then milled in the ordinary way, but the treatment undergone renders the husk more easily removeable, and the kernel much tougher and less easily broken, resulting in a larger percentage outturn of whole rice. Such rice keeps better after milling, does not turn sour readily after cooking, and has a higher food value, the soaking and steaming evidently causing part of the aleurone layer, removed in ordinary milling to be absorbed into the endosperm. The finished product is brownish in colour and is not eaten in Burma, nor is it appreciated in western markets, but for Ceylon, South India, West Indies, and South Africa, it is in great demand and sells for a price 10 per cent. in excess of that for ordinary white rice. The trade in parboiled rice is very profitable, and while the process used to be confined to the long slender grained translucent varieties, it is now applied to other sorts as well, the amount of parboiled rice produced in 1926 being double the amount for 1925. Small country mills do a good deal of this trade and the smell which accompanies the soaking and drying processes is, in some of the smaller towns, overpowering. An effective and economical process for eliminating this smell has been worked out by the Agricultural Chemist to the Government of Burma, but its use to prevent what is in effect a public nuisance has not yet been enforced.

In the report on 'Rice' of the Indian Trade Enquiry issued by the Imperial Institute in 1920, the world's rice trade is divided into two great branches: "The Far Eastern branch requiring a cheap rice for feeding the native population; and the Western branch requiring large quantities of a medium quality rice and much smaller quantities of high quality rice.

The Far Eastern branch is catered for to a very large extent by Siam 'Field' and Indo-China rices, both poor cheap qualities, and to a less extent by Rangoon rice. The Western branch is supplied mainly by Rangoon, and Siam "garden" rices both medium qualities, and for the special qualities by imports from Bengal (Patna rice), Java, Japan, United States, Italy and elsewhere. For this trade also highly milled and polished rices are produced in Europe mills mainly from rice imported originally from Burma and Siam." This indicates fairly plainly the position of Burma rice as regards quality. With regard to quantity Burma occupies a very dominant position indeed. In the year 1925-26 the net exports of cleaned rice over imports exported by rice-growing countries to foreign countries was over 33½ million quintals of 220 lb. If we consider India as a foreign country to Burma and add to this figure, Burma's exports to India the total is raised to 63½ million quintals; and taking this figure as representing approximately the net export of rice from all rice-growing countries, Burma contributes over 50 per cent. of the whole. In addition to being large, the supply of Burma rice is very constant, and varies little in quality from year to year, with the result that it has become the standard of this commodity and occupies a dominant position in the trade. The actual exports of rice and rice products in the year 1925-26 amounted to 3,546,026 tons and it is interesting to note the chief countries to which shipment was made. A list of all the countries taking Burma rice would include most places on the map but the following eleven countries take over 80 per cent. of the total:—

	Tons.	*Percentage of total.*
India	972,517	27.5
Germany	373,751	12.5
Ceylon	345,707	9.75
Japan	285,410	8.00
Straits Settlements and F.M.S.	231,471	6.5
China (Exc. Hongkong)	149,662	4.25
Java	113,578	3.25
Netherlands	97,740	2.75
Sumatra	85,370	2.5
United Kingdom	80,526	2.25
Egypt	71,014	2.00

The large exports to India are noteworthy, and although the tonnage given has been converted to rice and rice products, 155,021 tons of rice in the husk are included. The only other country taking rice in the husk is Ceylon which took 32,621 tons. In view of the fact that nearly 90 per cent. of the rice taken by Ceylon was parboiled, this rice in the husk was possibly intended for parboiling too. Another interesting point brought out by these figures is that Germany which dropped out of the Burma rice trade completely during the war has now almost entirely recovered its pre-war position, and the United Kingdom which competes with Germany in the remilling industry, has lost ground to a corresponding degree. The total value of the rice and rice product exports given above for year 1926 was Rs.49,83,41,041 or approximately £37,375,578. The recently harvested crop of 1926-27 has reached record dimensions and the estimated exportable surplus is 15 per cent. greater than that of the previous year.

For consumption in Burma and for eastern markets the soft round opaque type of rice shown as Midon in the list of milling grades is preferred, and realises a price of 10 to 15 per cent. more than that paid for the vitreous hard sort known as Ngasein and preferred in Europe. These are not fine rices as ordinarily understood, but there are fine rices in Burma which have not yet been exploited as fully as they might.

(*To be continued.*)

FERTILIZERS FOR COFFEE.

THE following is a summary of recent work on this subject carried out over a series of years at the Porto Rico Agricultural Experiment Station, Mayaguez, and reported in *Bulletin* No. 31 of the Station by Mr. T. B. McClelland, Horticulturist:—

"In the experiments reported in this bulletin nitrogen, phosphoric acid, and potash, singly and in combination, were applied to coffee trees through a series of years and their effects on growth and yield noted.

In a planting of 40 small plats the general trend of future performance as affected by fertilization was indicated as early as the first important crop. The production over an 8-year period showed that potash was effective in increasing yield, and that this was true particularly where nitrogen was used in addition to potash. Heavy applications of nitrogen unaccompanied by potash very adversely affected growth and fruiting, whereas the same quantity of nitrogen in conjunction with potash proved beneficial rather than injurious, trees so fertilized developing luxuriant foliage and heavy crops of fruit. The plat ranking first in yield received this fertilizer combination at the maximum rate. Analyses of the soil solution showed this plat to be higher in acidity than any in the field, thus placing coffee among the acid-tolerant crops. Growth and yield failed to show that the addition of phosphoric acid was of benefit. Growth and yield were closely correlated.

In several other series of plats use of complete fertilizer resulted in all cases in moderate to pronounced increase in yield. In one series the yield from the plat receiving complete fertilizer

was approximately three times as great as from the check plat for a 13-year period. On this soil all three elements were necessary for maximum yields.

The size of the coffee cherry was observed to be related to the yield, a notable increase in yield being accompanied by a slight reduction in size of cherry. The only observed effect of fertilizer on size was thus indirect.

In field tests nitrogen appeared to increase early production. In various pot tests it greatly stimulated growth, as was shown by a large increase in number of leaves, in weight of foliage, stem, and roots, and in height. Although the number of leaves was increased, no correlation was observed between leaf length and kind of fertilizer applied.

In both field and pot tests ammonium sulphate, applied semi-annually, proved much more effective than sodium nitrate in increasing both growth and yield in a planting of Bourbon coffee.

In co-operative experiments with sodium nitrate alone, applied semi-annually for two years on one plantation and four on another, no increase in yield attributable to its use was observed. On the latter plantation a change in fertilizer treatment involving the use of ammonium sulphate and sodium nitrate each singly and in complete fertilizer was followed by an increase in the yield of the plats receiving complete fertilizer. The effectiveness of ammonium sulphate alone was less pronounced and no benefit whatever was observed following the continuance of sodium nitrate alone. In pot tests equal quantities of sodium nitrate were much more effective when applied in small monthly rather than in larger semi-annual applications, and the addition of sulphur proved beneficial. Monthly applications of sodium nitrate with semi-annual applications of sulphur proved more effective than semi-annual applications of ammonium sulphate. The latter, however, retained its established position of superiority over sodium nitrate alone in semi-annual applications.

Both pot and field tests failed to indicate any benefit from liming.

It is evident that the coffee tree responds to fertilization. On certain soils a large increase in production may be expected to follow the application of suitable chemical fertilizers in sufficient quantity. The need for potash is particularly evident. This is in harmony with analyses of the fruit. Anstead and Pittock state that 'when a chemical analysis of parchment coffee, or coffee berries, is critically examined one fact at once strikes one as being prominent. Potash is a dominant factor in the mineral constituents of the coffee bean. This is prominently brought out in the ash analysis where there is more potash than anything else. This being so it is only logical to suppose that a fertilizer containing a preponderance of potash should help the coffee tree to ripen up and hold its crop.'

Either ammonium sulphate or sodium nitrate may be used to supply nitrogen, but the employment of the former is preferable, since in a majority of the tests it has clearly demonstrated its superiority over sodium nitrate in semi-annual applications.

The heavy clay soils so extensively planted with coffee in Porto Rico are for months at a time washed by heavy and frequent rains. The surface is generally steeply inclined and subject to rapid drainage. Under such conditions it is probable that much of the nitrogen from large semi-annual applications of sodium nitrate would be washed away without benefit to the trees to which it was applied.

The beneficial effect of potash and nitrogen in combination has been clearly demonstrated, but the most favourable ratio between the two remains a problem for future investigations. Until further evidence is obtained on this point, it is believed that a fertilizer for coffee should run proportionally high in potash, such, for example, as one obtained by mixing ammonium sulphate and potassium sulphate in equal parts by weight and containing approximately 10 per cent. nitrogen and 24 per cent. potash. This combination may prove adequate without the addition of phosphoric acid for certain soils. In other cases it may be advisable to include phosphoric acid, adding to the mixture an equal part by weight of superphosphate. It is suggested that each planter who uses chemical fertilizers for his coffee determine the need of his soil for phosphoric acid by applying to experimental plats each of these two mixtures. The plats should preferably be adjacent and as nearly as possible alike in slope, soil, and condition of trees. The fertilizer combination containing only the two elements may be applied at the rate of 300 pounds to the acre, and the other at the rate of 450 pounds.

In the absence of definite knowledge as to the best time to apply fertilizer, applications may be made twice annually, the first soon after the termination of the collection of the crop, and prior to the blossoming of the following crop in late November or December, and the second in May or June when the new crop is in process of development. The fertilizer should be well distributed over the range of the coffee roots and incorporated with the surface soil.

Whether the application of chemical fertilizers to coffee will prove a profitable practice must depend upon the relation between cost of fertilizer and selling price of coffee. Within the period covered by the tests here reported the prices of both varied greatly. With high prices of coffee, use of fertilizers may prove profitable, and conversely, with low prcies it may entail a loss."

The Editor requests that any subscriber who fails to receive *Tropical Agriculture* regularly should communicate with him immediately in order that the matter may be rectified.

PASTURE GRASSES.

The Relation between their Mineral Content and the Health of Stock.

The following article is abstracted mainly (1) from a report by Mr. R. E. Kelsick, Agricultural Superintendent and Chemist, St. Kitts-Nevis, British West Indies, which appeared in the Annual Report for 1925-26 of the Agricultural Department of that Presidency, and (2) from a report on the stock of Antigua, by Mr. H. Goodwin, M.R.C.V.S., Government Inspector of Animals.

(1) EXTENSIVE investigations of the mineral content of pasture grass are being conducted at various research institutions in the British Isles, and it has been already clearly demonstrated that the mineral content of the feeding stuff supplied to farm animals is an important factor in the nutrition of such animals. It has been found that a deficiency of mineral salts may lead to many serious forms of diseases. "Bent leg," a rachitic disease occurring in sheep has been found to be the result of such deficiency. Osteo-malacia in cattle in Norway has been shown to be caused by an insufficient supply of minerals, particularly lime and phosphoric acid. The very low percentage of phosphorus in the crops and soil of the Bihar district in India has been found to be responsible for the very low milk yield from the cows in that state. Osteoporosis of horses, donkeys and mules in certain districts in the Transvaal, has been demonstrated to be due to a great excess of phosphorus, and deficiency of calcium in the fodder and pasture crops. In the Union of South Africa, the low phosphorus content of the natural vegetation is a limiting factor in the growth of young stock, in the condition of older cattle and in the milk yield of cows.

The samples of grass analysed by Mr. Kelsick were taken from four pastures in St. Kitts and two in Nevis. In addition, a sample of sugar-cane tops, which is largely used as a feeding-stuff, has also been examined. The herbage of these pastures consists of mixed types of West Indian grasses chiefly Bahama or Devil's grass (*Cynodon dactylon*), Wire Grass (*Sporobolus* sp.), *Paspalum* sp., and *Eleusine indica*. In some instances "wild clover" was present to a very small extent.

The composition of the herbage of the pastures, with respect to nitrogen, total ash, and individual mineral constituents, is shown in the following table:

Pastures in St. Kitts and Nevis.

RESULTS EXPRESSED AS PERCENTAGES OF WATER-FREE MATERIAL.

	Pasture No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8
	Per cent.							(cane tops.)
CaO	0.440	0.223	0.437	0.320	0.328	0.273	0.392	0.425
P_2O_5	0.408	0.858	0.379	0.672	0.590	0.682	0.274	0.472
Na_2O	0.257	0.458	0.290	0.429	0.421	—	—	0.163
K_2O	0.569	1.027	0.466	1.257	1.264	—	—	0.896
Cl	0.394	0.698	0.539	0.779	0.986	0.707	0.516	0.687
N	1.142	1.196	0.716	0.477	1.182	0.868	1.006	1.184
Total Ash ..	14.810	10.830	13.980	12.840	18.940	10.260	12.630	9.120
Silica, in Free Ash ..	3.860	4.690	3.260	4.710	6.570	4.120	—	4.520
Fibre	—	—	26.1	20.4	—	—	23.1	—
CaO : P_2O_5 ..	1: 0.93	1: 3.85	1: 0.87	1: 2.1	0: 1.8	1: 2.5	1: 0.70	1: 1.11

Pasture No. 1 Lowland pasture, St. Kitts, Leeward District.
Pasture No. 2 Lowland pasture, St. Kitts, Salt Ponds Estate.
Pasture No. 3 Hill pasture, St. Kitts, Leeward District.
Pasture No. 4 Lowland pasture, St. Kitts, Windward District.
Pasture No. 5 Lowland pasture, St. Kitts, Windward District.
Pasture No. 6 Lowland pasture, Nevis.
Pasture No. 7 Lowland pasture, Nevis.
Pasture No. 8 Sugar-cane tops from estate in Leeward District.

Discussion of Results.

The herbage of the pastures examined is deficient in nitrogen, and in the essential mineral elements which are estimated. The results obtained are similar to those recorded for the pastures of the Falkland Islands, where the high mortality amongst sheep led to an investigation of the mineral content of the natural pastures of those Islands.

The lime-phosphate ratios of pastures 2, 4, 5, and 6, indicate that the herbage is ill-balanced in respect of these constituents, the phosphate being present in excessive amount in relation to the lime. It would be an easy matter to improve these pastures by proper treatment, but with the present low prices for sugar, it is hardly likely that land-owners could be induced to do anything in this direction. However, a practical demonstration of the improvement of the herbage of a natural pasture by slagging and liming should be of considerable value to those interested in this subject.

It is of interest to record that on the estate in St. Kitts, which is regarded as possessing the best grazing for stock, and where cows generally give a satisfactory yield of milk, the animals are supplied with a well water of the following composition :

Composition of Well Water.

	Parts per 100,000
Total dissolved solids	..381.4
Temporary hardness as Calcium Carbonate	22.2
Sodium Carbonate	.. 43.7
Chlorine	..159.5
Equivalent Sodium Chloride ..	..262.9
Sulphate present	

Unfortunately, there are no statistics available relating to the stock of the Islands which would enable one to form a definite opinion of the effect of the low mineral content of the pastures on the stock of the Presidency.

(2) Mr. Goodwin calls attention to the necessity of proper pasture treatment in Antigua. His remarks would appear to have wide applicability to many parts of the Tropics. He stresses the fact that the yield of hay and the desirable mineral content of grass can readily be increased by suitable applications of lime and phosphatic fertilizers. Experiments at the Cambridge School of Animal Nutrition have recently shown that the nutritive value and the digestibility of grass kept close-cropped by stock, is very much greater than those of grass allowed to grow to maturity in meadows. Experiments in Germany have demonstrated that manuring pastures with nitrogenous fertilizers, mixed in carefully-balanced proportions with potash and phosphate, encourages rapid growth of herbage, and increases the feeding capacity of the pastures to almost double. Closely-cut good pasturage is as nutritious and as digestible as most of the concentrated foods used in stock-feeding. It contains abundant necessary vitamins and ample mineral salts for maintaining animals in a state of sound health and high productivity.

The following data, submitted by Mr. Goodwin in his report draw attention to the lime and phosphate contents of various categories of British pasture herbage, and of herbage comprising the unsatisfactory pastures of the Falkland Islands, also referred to by Mr. Kelsick :

Kind of Pasture.	*Lime.* %	*Phosphate.* %
(*a*) *British pasture herbage*		
Cultivated pasture ..	1.00	0.74
Poor natural pasture (eaten) ..	0.56	0.60
Poor natural pasture (not eaten) ..	0.30	0.37
(*b*) *Falkland Islands pasture herbage*		
Poor natural pasture (eaten) ..	0.29	0.54
Poor natural pasture (not eaten) ..	0.14	0.24

Apart from the necessity of mineral salts such as calcium compounds and phosphates, certain other substances are required by stock if they are to remain in good condition. The chief of these, are, according to Mr. Goodwin's report, sulphur, iron, sodium and chlorine. Of these, iodine presents significant interest through the findings of recent experimenters who have proved that iodine in small amount is absolutely essential to animal metabolism particularly during pregnancy.

In certain parts of the United States, the feeding of a suitable salts-mixtures with the ration is practised with a view to correcting, at least partially, the mineral deficiencies in food. The following formula represents a good mineral mixture for cattle :

	%
Calcium carbonate	40
Steamed bone meal	20
Common salt	20
Potassium iodide	0.01

Cows in full milk may be given daily four teaspoonfuls of this mixture. For pigs, the following mixture is satisfactory.

Wood ashes	4 bushels
Common salt	8 lb.
Air-slaked lime	2 quarts
Steamed bone meal	10 lb.
Sulphur	1 lb.

The wood ashes presumably contains sufficient iodine for the need of pigs.

F. H.

CHEMICAL NOTES.

Compiled by the College Department of Chemistry and Soil Science.

Crotalaria as Soil Builder.

The October 1927 number of the *Journal of the American Society of Agronomy*, contains an interesting article by Dr. W. E. Stokes, on Crotalaria as a soil-building crop. The species *C. striata* was successfully grown at the Florida Agricultural Experiment Station, without previous soil inoculation. The crop yielded in 1925, 177 lb. of hulled seed per acre. The yield of dry matter was much greater than that given by two other sorts of leguminous cover-crops grown at Gainsville in Florida at the same time, as the following table shows.

	Tons air-dry matter per acre.			
	1924	1925	1926	*Average.*
Velvet bean	0·98	0·82	0·76	0·85
Cowpea	1·48	1·30	0·52	1·10
Crotalaria striata	2·59	1·90	4·18	2·89

The content of nitrogen in the dry matter was also higher than that of the other crops.

	Per cent. nitrogen (dry basis).	
	Tops.	*Roots.*
Velvet bean	2·51	1·48
Cowpea	2·29	1·65
Crotalaria striata	2·78	0·92

When turned into the soil, Crotalaria proved superior to velvet bean, cowpea, and Mexican clover as soil builder, causing greatest increase in yields of maize and sweet potato grown on land into which these cover-crops had previously been ploughed.

* * *

Chemical Industries in Southern India.

A letter to the Editor of the News Edition of *Industrial and Engineering Chemistry*, 10th December, 1927, from K. R. Natarajan, describes some researches that have been carried out under the guidance of the Director of Industries, Madras. The utilization of *limes* and *tamarinds* was among the first problems to be investigated. Limes grown in the Krishna District contain only 3 per cent. of citric acid (compare 7 per cent. for West Indian limes). Consequently, it was found unremunerative to use them for manufacturing citric acid. The supply of limes is inadequate, and the cost of re-agents and plant is high. The greatest hope of success lies in the production of calcium citrate from South Indian limes. It was also found unremunerative to manufacture tartaric acid from tamarinds, although calcium tartrate may perhaps be manufactured with profit. If the sugars of the tamarind could feasibly be converted into alcohol, the industry might be made to pay.

Investigations into the possibility of manufacturing *malted foods* from cholam (Guinea corn or Imphee) indicated that this was quite practicable, but that it would need adequate finance to render it commercially successful.

The most useful research, however, has proved to be that on *coir production*. The conditions for satisfactory retting have been carefully examined, and the bacteriology of the process has been studied. It was found that, contrary to established belief, brackish water is not essential to good retting, and that coconut husks themselves contain the necessary bacterial flora. During retting, the material that binds together the coir fibres is decomposed. It is made up chiefly of mucilaginous or gummy substances. Attempts to soften the husk by the use of chemical agents, yielded very inferior coir. The best procedure for retting was found to consist in a preliminary soaking process (whereby suitable bacterial growth was established), followed by crushing between rollers, and finally returning the crushed husks to the soaking vats. By this means, the time of retting was considerably reduced, and good quality fibre could be obtained in less than two months.

* * *

Chilean Nitrate.

Chile Nitrate at present occupies an interesting position. From the moribund condition of last year, the industry has awakened to renewed activity. A year ago, synthetic nitrogen so severely competed with the natural product, that the complete collapse of the Chile industry was expected. In February last, the output had sunk to the phenomenally low figure of 70,000 tons. The whole output for the twelve months ending 30th June, was only just over a million tons as against a normal production of over four million tons. But already in June, there were signs of rejuvenation. Production for that month jumped to over 200,000 tons, and orders were received for delivery during June, 1927 to June, 1928, for more than two and a quarter million tons.

The causes of this rejuvenation of an apparently dying industry are various. Probably the chief among them is the free selling policy adopted last April. This freed the producer from fixing prices in advance. Other causes are an enlightened attitude on the part of the Chilean Government, (which has resulted in an alleviation of taxation); reductions in railway freightage costs; increased demands for Chilean nitrate by American cotton growers, and the adverse effect upon ammonium nitrate sales arising from pronouncements on its demerits by certain agricultural experts.—*The Industrial Chemist*, Nov., 1927.

SUGAR NOTES.

Compiled by the College Department of Sugar Technology.

Value of Hawaiian Final Molasses.

The disposal of the molasses is considered in a report of the Association of Hawaiian Sugar Technologists, Sixth Annual Meeting, October, 1927, published in the *La Planter*, Vol. LXXIX, No. 24, p. 456. Conditions in Hawaii vary widely as to the returns received for the molasses by different plantations. A few of the plantations favourably situated, and with proper shipping facilities, receive two and three times as much as others, while those not in a position to ship get nothing at all.

With the present prices of gasolene there is apparently no good reason to manufacture motor fuel from molasses, and the two plantations which started to do so a number of years ago have closed down or dismantled their distilleries.

In connection with the idea of selling Island-made alcohol on the mainland, the local interests have had the benefit of a report by Mr. Edgar Baruch in which he points out that the outlook for such an enterprise is extremely unfavourable owing to the inability of the markets to absorb a quantity of alcohol in any measure consistent with the ability of numerous distilleries throughout the United States.

From the experience of selling molasses this year, it appears that this condition has not changed yet, and there remains the question of burning the molasses for the recovery of the potash.

Only three plantations have reported the K_2O percentage of their molasses : Ewa Plantation, 4 to 5 per cent. ; Pioneer Mill Co., 6 per cent. ; Paauhau Plantation Co., 3 per cent. ; The present value of K_2O, as given by R. Q. Smith, of the Pacific Guano and Fertilizer Co., is $58.00 per ton, or 2.9 cents per lb.

Mr. Elliot, of Paauhau, has kept detailed statistics of the operation of a large modern furnace. He gives the cost of operating at $0.67, per ton molasses, and employs four men. The cost of the Paauhau furnace was $4,500.00, the potash content of the molasses 3 per cent. and a recovery of 79 per cent. is now obtained as a result of much experimenting and with close supervision.

If it is assumed that a suitable installation can be put up for $3,000.00 to take care of 15 tons molasses per day, operating 300 days per annum, the following is calculated :

	Per ton molasses.
Interest and depreciation	$ 0.06
Operating	.67
Cost of bagging and spreading	.10
Total	$ 0.83

With 3 per cent. K_2O in molasses and a recovery of 75 per cent., 45 lb. K_2O per ton of molasses can be obtained on a value of $1.30 per ton of molasses.

With 5 per cent. K_2O in molasses, the value becomes $2.17 per ton of molasses.

It depends, therefore on the K_2O percentage of the molasses and on the net return per ton of molasses if sold whether or not it pays to burn the molasses for potash recovery, and furthermore, on the ambition of whoever has direct charge of operating the furnace, to obtain the highest possible recovery.

* * *

Industrial Products from Filter Press Cake.

The results of work carried out by G. Guanzon, at the College of Agriculture at Los Baños and described in *Sugar News*, Vol. VIII, No. 11, p. 877, are summarised as follows :—

1. Filter press cake from a Philippine central was analysed for proximate composition, and comparative extraction of the cane wax from the air-dry cake was undertaken. The methods of analysis employed in the determination of the proximate composition and in the extraction are described. The results are tabulated.

2. The average composition of the material studied was as follows :

In air-dry sample—Moisture, 12.08 ; ash, 31.05 ; lime, 8.77 ; phosphoric acid, 7.34 ; nitrogen, 1.34 ; sucrose, 4.06 ; reducing sugars calculated as glucose, 0.11 ; and ether extract, 8.40.

In oven-dried sample—Ash 35.32 ; lime, 9.98 ; phosphoric acid, 8.35 ; nitrogen, 1.53 ; sucrose, 4.61; reducing sugars calculated as glucose, 0.13 ; and ether extract, 9.59.

3. The extractable cane wax from the air-dry cake, using denatured alcohol as solvent, ranges from 4.06 to 5.27 per cent. Comparative results of extraction show that gasoline is superior to denatured alcohol as solvent for recovering wax from press cake, but its high market value and low percentage of recovery because of its high volatility and its inflammability, do not seem to warrant its use in commercial scale production.

4. Utilization of cane wax from filter press cakes in Philippine central can be made profitable, since the denatured alcohol used for solvent is now manufactured in the centrals from waste molasses.

5. The residue from the extraction has some fertilizing value, the fertilizer constituents of the cake being unaffected by the solvent in the process of extraction.

6. Cane wax may find many uses as an ingredient in the manufacture of various products, such as shoe polish, Christmas candles, wax varnishes, sealing wax, tailor chalk, &c. The crude product can be used without being first purified.

WE have received from the Froghopper Committee Part IX of the Minutes of Proceedings which contain, in addition to the usual progress reports, papers by P. E. Turner, B.SC., A.I.C., Soil Scientist, on Studies in Trinidad Soils ; The Lime Status in Trinidad Soils and its Relation to Froghopper Blight by H. R. Briton-Jones, PH.D., D.SC., on Green Muscardine.

REVIEWS.

ADMINISTRATIVE REPORT OF THE DEPARTMENT OF AGRICULTURE, CEYLON, 1926.

Mr. Stockdale is to be congratulated on his report: it covers eighteen pages and is a full and interesting resumé of the work which is being carried on by the members of his Department, whose separate reports are responsible for the remaining fifty pages of the volume before us. There is so much of interest, that it is impossible to do more than notice some of the points which appear of particular import. In passing, it is noteworthy that Ceylon finds it worth while to expend nearly £50,000 a year on her Agricultural Department, which includes in the sphere of its activities a flourishing School-garden side—since the days of Mr. Drieberg, School gardens have always been important in Ceylon—as well as the upkeep of a number of ornamental parks and gardens. Substantial grants in aid were also made to the Imperial Bureaux of Mycology and Entomology.

The planting industry in Ceylon dates back a good many years, and a problem which has begun to attract considerable attention is the erosion which is occurring on the steep slopes on which tea and rubber are usually planted. Time was when the advocates of "clean weeding" held the field, but the use of cover crops, among which *Indigofera endecaphylla*, *Centrosema pubescens*, *Vigna oligosperma* and *Gliricidia maculata* seem to be the most successful, is now a common practice. Other remedies lie in terracing, silt pits, and the planting of contour hedges. Mr. Stockdale does not, in the reviewer's opinion, take a sufficiently strong attitude towards the *contour planting* of tea: the difficulties alleged on account of plucking or manuring could with a little trouble be easily overcome, and with this method of planting, erosion is largely stopped before ever it has a chance to become serious.

The Ceylon rubber industry has evidently decided that among the steps that can be taken to improve the quality of their trees, bud grafting is the most important. It is held that the efficacy of this has been established in the Dutch East Indies, and two Ceylon gentlemen are reported to have paid a visit to that country to see what had been accomplished. The work of selecting the mother trees from which to take buds, is now being undertaken by a number of estates, while the Department is assisting not only by propagating from its best trees, the records of which go back some years, but is actively distributing seed from known good high-yielding individual trees.

More welcome than all this, however, is a description of the work of rice selection which is being carried out by the Economic Botanist, and the successful methods by which the improved seed is being brought to the notice of the grower and distributed to him. The reproach has before now been levelled at the Ceylon Agricultural Department that it was concerning itself too much with "planting" products, ignoring the immensely important indigenous production of food grains. That this is no longer true, if indeed it ever was, will be clear when we read that over 4,000 individual plots of paddy selections are undergoing a preliminary test, and that in spite of discarding over 750 selections, the Economic Botanist still has more than 1,000 on his record books. We seem to remember that a good deal of work on this crop was done many years ago by Lock, who claimed to have produced strains that gave considerably more than the local rice, but in those days, the value of such work was not realised, nor was there any organisation for getting improved strains out to the cultivator in the district, and they were presumably allowed to die out.

A reference is made by the Entomologist to the successful introduction of the imported *Dactylopius tomentosus*, a cochineal insect and its establishment under field conditions in two places in the island. The Director amplifies this by stating that the insect cleared an area of fully 65 acres of *Opuntia dillerii* (Prickly pear) at Trincomalee. The reviewer confesses to feeling sceptical about the possibility of this insect being of real economic value, and the progress of this experiment will be carefully watched.

As in so many other countries, the Water Hyacinth is responsible for considerable expense. Four years ago, attention was drawn to the increase in this pest, but it was only this year that an organised campaign was initiated to effect an improvement. The District Officers report the thorough clearing of local infestations in various parts of the island.

We recommend the report to anyone who wishes to learn something of the organisation of a Tropical Department of Agriculture, as well as to those who are interested professionally. An annual report, which is, after all, a report made to the Administration, is not and cannot be an ideal method of learning about the work of the Department, and we note that a Year Book is also published, in which the various problems are treated in a more connected way, but there are a few improvements which might be made. The peculiar order in which the section reports are printed, make it difficult, in the absence of an index, to refer to them readily. And, surely, there is a limit to the extent to which vernacular terms should be used: it is interesting, for instance, though not very illuminating, to read that in connexion with the increase in the area of a paddy station, '*asweddumizing*' has already been started. Yields per acre should be reported in pounds, and not in hundredweights, quarters and pounds. Finally we do not suppose that this report is a particular offender in this respect, but it seems a pity that a report dealing with the calendar year and signed by the Director on 24th March should have been sent to the printer on 13th September and only printed in October.

R. C. W.

COLLEGE NEWS.

Mr. G. G. Gianetti, M.A., of Cambridge University, has been appointed Sub-Editor-Librarian.

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Sir Frederick Lugard, a Governor of the College, has been made a Baron and our respectful congratulations are offered to him.

* * *

The College has recently been visited by Sir Thomas Holland, K.C.S.I., F.R.S., the distinguished geologist and Rector of London University.

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The Executors of the late Sir Arthur Shipley have informed the Governing Body that the late Chairman had bequeathed his portrait by William Nicholson to the College. The portrait will be hung in the Council room of the College.

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Mr. D. R. D. Wiles, Diploma Student of the College 1922-25, is engaged as a Plant Disease Inspector on the Staff of the Department of Agriculture, Barbados, being specifically detailed for work in connection with Mosaic Disease of sugar-cane.

* * *

The C.M.G., was conferred upon Mr. Odin Faulkner, Director of Agriculture, Nigeria, and Major Robert Archibald, Director of the Wellcome Tropical Research Laboratories, Khartoum, in the New Year's Honours List. We offer our congratulations.

* * *

Through the courtesy of the Ste Madeleine Sugar Company, Professor C. Y. Shephard visited the estates of that Company during the period 29th December, 1927, to 9th January, 1928, in connection with Agricultural Credit Societies and estate accountancy.

* * *

Amongst others, the College has also been visited by Mr. Percy Hurd, M.P., of Devizes and Honorary Secretary of the West India Parliamentary Committee. Mr. Hurd was accompanied by Mrs. Hurd and their son Mr. Anthony Hurd, who is farming in Wiltshire and is the Farm Editor of the *Field*.

* * *

Congratulations to Sir Algernon Aspinall, the Secretary of the College, on the honour of Knight Bachelor bestowed on him in the New Year's Honours List. His long and distinguished service as Secretary of the West India Committee, and his work as Secretary of the Imperial College of Tropical Agriculture, since its inception, have thus met with suitable recognition.

* * *

Plans and estimates for the erection of a Low Temperature Station and Cold Storage Plant to deal with Bananas and other tropical fruits have now been finalised and it is hoped to commence erection shortly. The funds are to be provided by the Empire Marketing Board. Two special research officers for investigations into the physicological and pathological aspects of the problems involved will shortly be recruited.

* * *

Mr. L. F. Hitchcock of Brisbane, Australia, was a recent visitor to the College. Mr. Hitchcock is employed by the Queensland Government, working on the extermination of the Prickly Pear which has been a serious pest in that country. He is stationed in Texas and is concerned with the selecting and despatching of insects which feed upon the cactus. Varied precautions are taken against the production of insects which might become pests on other plants. A very considerable degree of success has already been achieved, the most beneficial that was ever introduced into Queensland being one of the cochineal mealy bugs and a small moth of the family *Pyralidae*, the larva of which is a borer in the tissues of the Prickly Pear.

* * *

A party consisting of Professor R. C. Wood, Mr. A. L. Baker, Lecturer in Agriculture, Mr. G. Wright, Lecturer in Economics, and six post-graduate scholars of the Empire Cotton-Growing Corporation, who are at present in residence at the College, visited St. Vincent during the Christmas vacation and spent about a week in the Island. Particular attention was paid to the cultivation and economics of the Sea Island crop for which this Colony is famous. Attention was also paid to alternative crops such as arrowroot which can also be grown in this Colony. The thanks of the College are due to the Agricultural Superintendent of St. Vincent (Mr. Jackson) for his care and trouble in making all the necessary arrangements.

BOOKS RECEIVED.

WE have to acknowledge the receipt of the following books :—

BOTANY.

The Respiration of Phycomices. S. R. de Boer pp. 246, *de Bussy*, Amsterdam.

Wustoff and Wachstum. F. W. Went, pp. 114, *J. de Bussy*, Amsterdam.

Forest and Water in the Light of Scientific Investigation. Raphael Zon, pp. 106. U.S.A. *Government Printing Office.*

ECONOMICS.

A Survey of Co-operative Legislation. The Horace Plunkett Foundation, pp. 130, *G. Routledge.*

Abstracts of the Proceedings of the Indian Central Cotton Committee, pp. 100. Indian Central Cotton Committee.

The Fluid Milk Market in England and Wales, R. B. Forrester, pp. 142. *H.M.S.O.* 6d.

TREND OF THE MARKETS.

[*The notes below are based principally upon running charts of the prices of the basic grades and upon general statistical information gleaned from contemporary publications and cablegrams and are intended to be a record of movements. An attempt is made, where possible, to indicate the market outlook at the time of going to press, but no responsibility for the accuracy and subsequent truth of such observations is assumed. Unless otherwise stated the prices quoted are spot, London.*]

SUGAR.—Markets have been unsettled. The New York Futures Exchange has been quiet and movements irregular. London prices tended to rise during the middle of December, but declined towards the end of the month. Preferential was quoted at 16*s.* 3*d.* on 1st December, 17*s.* on 16th December and 16*s.* 9*d.* on 9th January, Foreign 12*s.* 6*d.* on 1st December, 13*s.* 3*d.* on 16th December and 12*s.* 10½*d.* on 7th January.

* * *

COTTON.—Prices have continued to decline since our last report. The demand for American cotton has been moderate. Middling was quoted at 10.68*d.* on Friday, 9th December. A fair demand has been experienced for West Indian Sea Island. The following cable quotations refer to 7th January, Extra fine 26*d.*, Good 24*d.* per lb.

* * *

CACAO.—Values have continued to decline although during the second week of December more interest was shown in Fair Fermented Gold Coast cocoa on *f.o.b.* terms for forward shipments. The following quotations refer to the week ending 12th December. Accra fermented 61*s.* to 63*s.*, Trinidad good plantation 67*s.* 6*d.* to 70*s.* fine to superior 72*s.* to 76*s.*, Grenada fine 70*s.*, Ceylon fair to fine bold 77*s.* 6*d.* to 90*s.*, Arriba 77*s.* to 95*s.*, Bahia fair to superior 65*s.* to 72*s.*, Caracas fair to fine clayed 80*s.* to 120*s.* Cocoa butter was quoted at 1*s.* 8*d.* to 1*s.* 8¼*d.* on 12th December. On 7th January, 1928, Trinidad L.L.T. was quoted at 64*s.* to 75*s.*, and Grenada L.L.T. at 68*s.* 6*d.* to 70*s.*

* * *

COFFEE.—Prices during the first fortnight of December, 1927, were easier for the medium and lower grades, but very good prices were realised for good to fine lots. Imports of African coffee have been inferior in quality. First arrivals of new crop Costa Rica London cleaned realised 154*s.* to 172*s.* per cwt. Stocks in the interior of Sao Paulo were reported at 11,049,000 bags on 31st October last, and this combined with a smaller trade demand caused a drop in Superior *c.i.f.* from 98*s.* to 91*s.* per cwt. Later prices recovered and were quoted on 12th December, at 94*s.*

* * *

TEA.—Stocks in bond on 21st October totalled 216 million pounds compared with 196 million pounds a year ago. Prices show a decline quotations on 21st December being Ceylon 20.53*d.*, Indian 18.41*d.* and Java 16.08*d.* each per lb. average.

RUBBER.—During the latter half of November and the first week of December, 1927, the market continued active, but became much quieter with the approach of the holiday season. First Crêpe sold at 1*s.* 7⅜*d.* and Ribbed Smoked Sheet at 1*s.* 7¼*d.* to 1*s.* 7⅝*d.* each per lb. on 15th December. London stocks on 19th November, 1927, amounted to 69,850 tons and declined to 65,869 tons on 10th December. Heavy cuts are reported in the new assessments for the current Restriction Year and are said to average over 15 per cent. on last year's Standards. Closing quotation for Ribbed Smoked Sheet Spot New York on 14th December was 40½*c.* There is a tendency towards lower premiums for forward deliveries.

GAMBIAN GROUND-NUTS.

THE exports of ground-nuts from the Gambia during 1926-27 constituted 98.4 per cent. of the Colony's exports, the principal items of which are shown below :—

Ground-nuts ..	61,072 tons..	£862,578
Palm kernels ..	676 tons..	11,293
Hides and skins	113,083 lb. ..	2,795
		£ 876,666

A considerable portion of the total ground-nut crop is grown by "strange farmers" from adjoining French territories, but the improvement of transport in the French colonies is making the Gambia less attractive to these farmers, and is also diverting nuts grown there and previously exported through the Gambia.

The reaping of immature nuts and the absence of screening or grading resulted in the Gambian ground-nut earning an unenviable reputation. Some four years ago an Agricultural Department was established and the compulsory inspection of produce instituted under the Adulteration of Produce Ordinance of 1924 has resulted in a remarkable improvement in the quality of Gambian nuts. In 1923-24 adulteration averaged 8.175 per cent. ; this was reduced during 1926-27 to 2.029 per cent. The last ground-nut season was a difficult one, owing to irregular rainfall, low prices and a drop in the number of "strange farmers," in spite of which the crop reached the average figure of 60,000 tons. While the Director hopes that the decrease in the number of "strange farmers" will be checked, it is encouraging to note that younger members of the community under the influence of a money economy and settled government are throwing off the communal idea and farming on their own. The river with means of transport varying from the native canoe to ocean-going steamers serves the purpose of a trunk railway. Road motor traffic act as feeders. By supplying good seed, giving instruction in cultivation and insisting upon rigid inspection, the Department has placed this staple crop in a very sound position.—(*Report of the Department of Agriculture*, 1926-27.)